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# Reports

## Amazon Roulette



# LETTERS

## Breastfeeding efforts

I have noticed in some back issues of *Reports* that you have referred to the "bottle-baby" issue in Third World countries.

I want to bring to your attention the efforts being made in Canada to encourage breastfeeding. An information kit has been sent to some 62 000 doctors, hospitals, and public health nurses. Also produced was a bibliography and resource guide for those involved in teaching (*Learning about breastfeeding: a selected bibliography and resource guide*). This year, we are continuing our collaboration with La Leche League and the Canadian Paediatric Society in distributing a booklet full of practical information to 300 000 new mothers.

I have maintained a personal interest in the Third World situation over the past few years, and I would like to keep in touch with you on this topic.

A. W. Myres  
Child and Family Health Unit,  
Health and Welfare Canada

*Editors' note: The materials referred to in Dr Myres' letter are available, free of charge, from Health Services and Promotion Branch, Health and Welfare Canada, Jeanne Mance Building, de l'Eglantine St., Ottawa, Canada K1A 1B4. They should interest physicians, nurses, and health workers concerned with promoting breastfeeding around the world.*

## Cassava and goitre

Through the pages of *Reports* of July 1980, I have come to know many things about your research work on cassava. In India we call it "tapioka" and it is mostly grown in South India where I come from.

I am a priest working among the poorest of the poor of Bihar — the tribals known as Santhals. In the

past 20 years I have spent in Bihar, I have introduced the cultivation of tapioka into many places. I was surprised to read in your report the assumption that cassava is the cause of goitre. I have not seen this disease in South India among the people who take tapioka practically every day, but I have seen it in many places in North India where cassava is not grown at all. I feel that there must be some other cause for the disease.

I have planted cassava in many places and seen how profitable it is for the poor people. The yield of cassava in Bihar has been greater than the yield in South India, the home of cassava.

Fr. Joseph Cheruvil  
Tilaya  
Bihar, India

*Editor's note: In parallel with a major program to improve cassava crops, IDRC funded research that would clarify questions about the possible toxicity of long-term cassava consumption. Some months ago, the research group studying this question published its latest findings in The role of cassava in the etiology of endemic goitre and cretinism (IDRC-136e). Their conclusions are that cassava definitely aggravates goitre and cretinism in the areas of Zaire under study. It becomes toxic in those regions because substances from cassava compete with iodine in populations whose iodine intake is already insufficient.*

*In other areas of the world where cassava is an important part of the diet, there is still controversy. The coordinator of the IDRC cassava program, Barry Nestel — interviewed in the July Reports — says he has never seen a relationship between cassava consumption and goitre in other regions.*

*It might be that the iodine intake is sufficient elsewhere*

*— while in other areas, the iodine intake might be so low as to cause goitre even though cassava is not eaten. Such was the case in many mountainous regions of the world, including Europe, not long ago.*

## Aid as aid

I feel obliged to react to the Commentary "Aid as obstacle" (*Reports*, July 1980), in particular the statement that the cause of hunger and rural poverty is not over-population, a scarcity of resources, or lack of modern technology, but a tight concentration of control over food-producing resources. With due respect to the Institute for Food and Development Policy, I found it rather difficult to accept this conclusion and doubt it very much if it would readily be accepted by those concerned in other developing countries.

Even if the tight concentration of control over food-producing resources were to be accepted as the root cause of hunger and rural poverty, there are multitudes of means available to governments and aid agencies to eradicate this root cause other than to support those groups that are directly and indirectly confronting the issue of power, which would amount to intervention in the country's internal matters. Also, the authors of the book seem to have forgotten that people usually get the government they deserve. Instead of trying to bring power to people who may be incapable of using it, foreign aid can help these people to cultivate their own power by providing education and other basic necessities.

It is unbelievable that the poor are poor because they are prevented from achieving the power to secure these basic necessities, and that the governments of developing countries are not making

any effort to provide them. It would be more plausible to allow for the fact that, because these governments have to start the development effort from the base, they first have to build up necessary infrastructures in order to provide services to the poor. And there are many useful roles for foreign aid in this process, if the government and private aid agencies would only remember that their effort could be catalytic but marginal, and that the imposition of their own standards — political, technological, and financial — would really do more harm than good to the countries some of them sincerely intended to help.

Ms Priya Osthana  
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Economic Cooperation  
Bangkok, Thailand

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**Cover:** Afloat on the Amazon River near Manaus, Brazil, a determined young girl sells bead-ware. As large-scale development comes to the Amazon River Basin, her way of life may undergo radical changes. See story page 10.

**Back cover:** As well as disappearing into the blue like this one, many species of trees may be disappearing entirely as tropical moist forests are destroyed. See page 8. (Jack Redden photo)



# DEVELOPMENT IN MINIATURE

*Will developing countries use microelectronics  
— or be used by them?*

ROWAN SHIRKIE AND JEAN-MARC FLEURY

**T**he computer has disappeared. But it didn't go away, it became invisible. Microelectronics technology — based on the now famous silicon chip — has reduced the size, cost, and energy of processing and storing information to minuscule proportions. At the same time, it has expanded the power and usefulness of electronic information handling, and spread it to virtually every area of human activity.

For the industrialized countries, microelectronics will be the key to enhancing the productivity of manufacturing processes and the efficiency of business. Communications and a wide range of goods and services will be transformed with the addition of computer intelligence.

The electronics industry has rapidly become a major economic force in the world, generating over \$US. 100 billion in sales each year, and it is still growing. Analysts believe that it will overtake the automotive industry within the next 10 years to become the world's largest manufacturing enterprise.

The Organization for Economic Cooperation and Development (OECD) has stated that "the electronics complex will be the main pole around which the productive structures of advanced industrialized societies will be reorganized." And others have even suggested that it will be the state of a nation's electronics industry that will determine whether or not it is a developed country.

The shifting patterns of global production, trade, and investment that are wrapped up in the revolutionizing microelectronics technology will pose very special challenges to developing countries. At the same time, poor countries may have an opportunity of leapfrogging centuries of industrialization and bring some of the most advanced products of technology to bear on problems of education, health, food production, energy, and manufacturing.

But before developing countries see much of the positive side of microelectronics, they will almost surely suffer from the fallout of the industrial explosion in the North.

The flexibility and low cost of chip technology allows computer intelligence to be applied at many points throughout manufacturing processes. This can be done using microcomputers to control whole systems, or by directly including microprocessors in machines — robots. Robots already weld and paint cars, mine coal, assemble refrigerators, drill aircraft parts, and handle radioactive materials in nuclear power plants. They can and will do much more in the near future.

About 60 percent of modern manufacturing is done in batches too small for mass assembly lines. Reprogrammable, microprocessor-controlled robots can be employed in such small-lot manufacturing to reduce costs to about one-tenth of what they are now. Within 20 years — some forecasts say within 10 years — robots will provide half the labour in batch manufacturing. By early in the next century, robots are expected to produce half of *all* manufactured goods.



Above: Women in Malaysia assemble electronic components — eye damage comes with the job. Opposite: A silicon chip, containing over 65 000 connection paths and 36 000 transistors, "packaged" for business communications applications. Photo: Mitel Corporation.

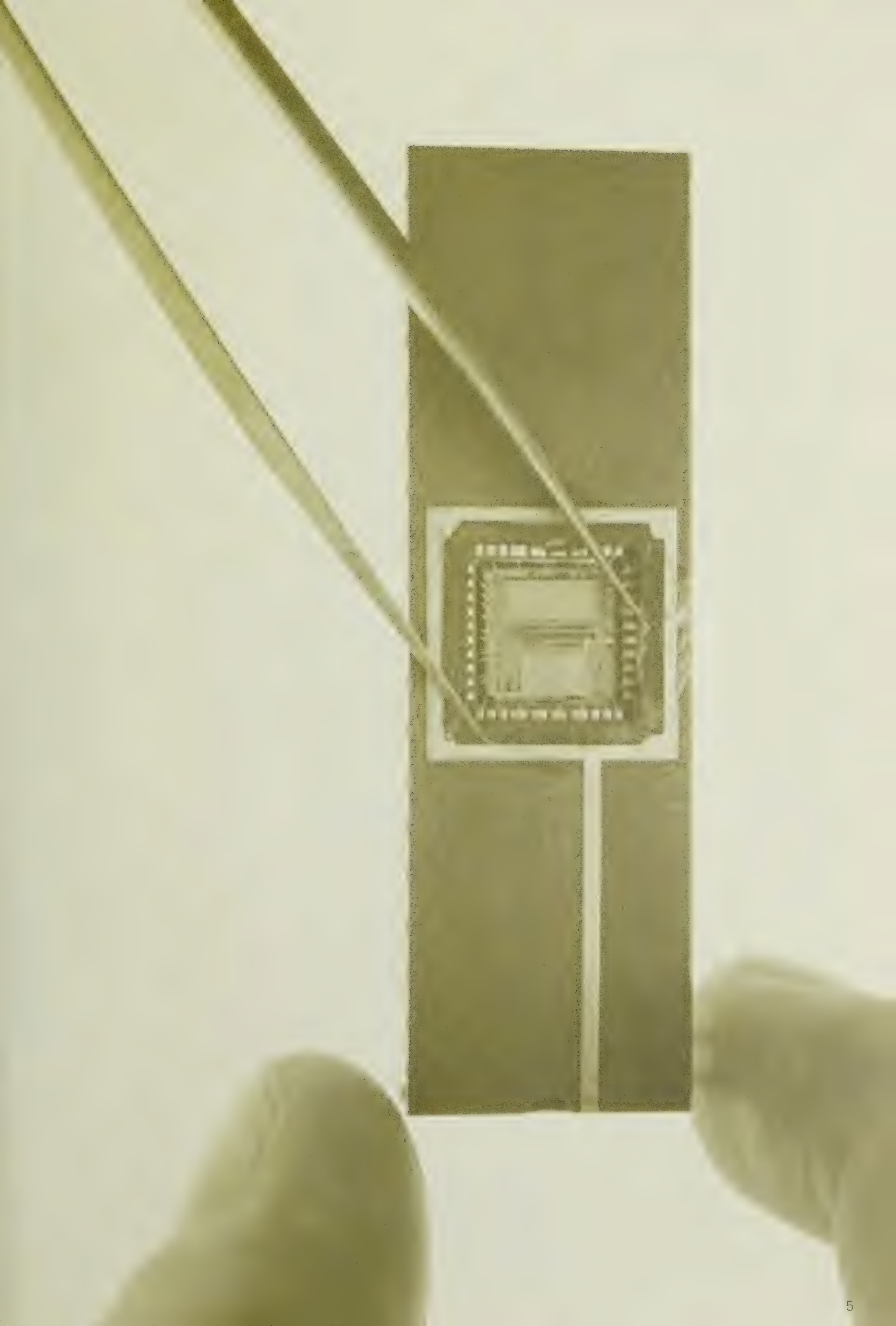
Such computerized assembly will change the competitive status of many industries and, indeed, it is the robot strategy by which the North plans to regain its economic advantage over developing-country manufactures. Microelectronics in factories will devalue one of the poor countries' greatest assets — cheap labour. The spectre of masses of jobless industrial workers has already begun to haunt the governments of the North. What of the South — especially those newly industrialized countries, whose measure of development success has been gained largely by penetrating markets in the North with cheaply produced goods?

## THE RURAL TERMINAL

Some futurists foresee that the computer has a positive role to play in the development of poor countries, and advocate a strategy based on the use of microprocessors. In his latest book, *Le Défi mondial* (The global challenge), Jean-Jacques Servan-Schreiber writes that the implementation of a "planetary Marshall Plan" hinges on the computer. He suggests that each village, no matter how poor and remote, be equipped with a computer terminal linked to a central network. With this terminal, the peasant farmer would have access to all of the information required to ensure good family health and improve agricultural yield. According to Servan-Schreiber, the village terminal could promote mass education without the intervention of foreign experts, while allowing the villagers to determine their own needs.

There is no lack of Third World intellectuals who, suspicious of the enthusiasm with which experts in the North push intermediate or appropriate technologies, wonder why the developing countries would not benefit rapidly from microelectronics, in the same way that they were quick to adopt the transistor radio.

Science fiction writer Arthur C. Clarke, famous for having predicted the advent of communications satellites, foresees the proliferation of "pocket professors" throughout the Third World, just as transistor radios are now found in even the most inaccessible villages.





*It is quite possible that "small is beautiful"  
will become a reality, not through a return to  
simpler technologies but through microelectronics*

The "pocket professor" would resemble a calculator and would be fed from an extensive library of educational programs recorded on memory modules. The student would select a desired course by plugging in the appropriate module. The student then simply pays close attention to the messages appearing on a display. Instruction might also be spoken: the electronic synthesis of human speech has now been mastered and "speak and spell," talking math-tutors, and other devices are already being marketed in North America. Mass-produced, these calculator-teachers would give rapid access to knowledge without the need to set up a costly school system or train thousands of teachers.

Nevertheless, microelectronics will not be invading developing-country villages in the near future, according to Kurt Hoffman of the science policy research group of the University of Sussex, England. Hoffman is studying the impact of microelectronics on industrialization and the Third World. His research is funded in part by IDRC. "What possible use could a poor illiterate farmer make of a terminal?" Hoffman wonders, "How could he actually use the information once it was provided?"

Hoffman feels that microelectronics will have an essentially negative impact on the Third World, although "it won't be the end of the world. Countries like Taiwan, Singapore, and Hong Kong will be quick to adopt the new computer assisted equipment," he says, "but the poorest countries will be unable to follow suit. It seems almost unimaginable that extremely poor countries will be able to take part in, or benefit from, the microelectronics revolution."

#### MICRO-INDUSTRIALIZATION

Even so, Hoffman does admit one small glimmer in an otherwise gloomy forecast of microprocessor-generated shocks for developing countries. Their use in industrial procedures and machines will mean automatic detection of breakdowns and damage. By coordinating the data gathered in real time by a group of sensors or fault detectors, the microprocessor-controlled system will take care of a number of tasks previously performed by operators. All this will help reduce the need for highly skilled human supervision as industrial machinery becomes self-monitoring, self-adjusting, and self-repairing (or, at least, self-diagnosing). It will consequently become profitable to build mini-factories on a wide range of sites without having to rely on expatriate consulting experts or on concentrations of services. These mini-factories — Kurt Hoffman already sees the first prototypes in the pulp and paper sector — will facilitate rural industrialization. In fact, it is quite possible that "small is beautiful" will become a reality, not through a return to simpler technologies, but through microelectronics.

The fact remains, however, that the bulk of expert opinion specifically concerned with the impact microelectronics will have on the Third World holds that the new technology will drive a wedge into the gap between rich and poor countries, widening it further.

Inevitably, the equipment and machines incorporating microprocessors will be more complex. Moreover, many instructions will be written in read-only memories, combining in one "package" both hardware and software. A mechanical device can be understood by taking it apart piece by piece, but it takes another computer to understand a microprocessor. Consequently, the new "smart" machines will remain just so many undecipherable "black boxes" to their users in the Third

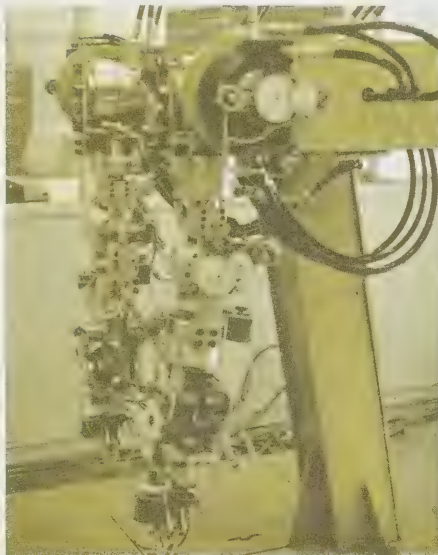


Photo: T. Kasvand

*A prototype industrial robot controlled by a microprocessor — the steel-collar worker.*

World. The technology transfer process will require increasingly complex methods, and it will no longer be possible to effect the transfer without the knowledge of the manufacturers, whose power will increase dramatically. Since most of the new data-processing techniques belong to the private sector, its members will be in an even better position to exact profits from their investments.

#### USELESS LABOURING

A great many countries hope to imitate Taiwan, Singapore, or South Korea. These "newly industrialized countries" owe their industrialization to extremely rapid growth in exports to the rich countries. Only a dozen of these countries share almost 80 percent of all the market value of exports of the Third World. The advent of microelectronics could well undermine economic development strategies based on export.

If several Third World countries have experienced rapid economic expansion through the export of textiles, clothing,

shoes, and electronic equipment, it is because their relatively cheap labour represents a distinct advantage. By automating factories and giving the brute, and repetitive tasks to robots, however, industrialized countries are preparing to make spectacular reductions in their labour costs. Kurt Hoffman and Howard Rush of the University of Sussex cite the example of a clothing manufacturer in the United Kingdom who has cut staff from 200 employees to 20 by using computer-controlled lasers to cut fabric. "Intelligent" sewing machines follow the outlines of the cut fabric pieces using photoelectric sensors, and sew various patterns following instructions provided by computer. In spite of the high initial purchase price of these machines, their output is such that it is again becoming profitable to manufacture clothing in high-wage industrialized countries.

Radios, television sets, tape recorders, and electronic games make up the third largest export category of the newly industrialized countries, after textiles and clothing. The large transnational electronics companies moved extremely quickly to open factories in other countries, explain Hoffman and Rush. Although these companies did not begin their "off-shore" operations until the mid-1960s, by 1971, 43 American firms had factories in Southeast Asia or Mexico. Here again, the move to microelectronics — in an industry to which it is crucial — could cause expatriated production to return home as quickly as it left.

The operations assigned to "off-shore" factories are mainly assembly and soldering of extremely fine wires that connect the integrated circuit components to output devices. Thousands of young women all over the world strain their eyes performing this highly demanding and precise detail-work. However, the electronics industry is just completing its tool-up for the automation of these operations. It will shortly become more profitable to bring the assembly operations back to the industrialized countries where manufacturing already takes place. Rush and Hoffman expect that the large electronics firms will be less and less interested in establishing factories in countries outside the North.

It seems so probable that robots will level the "cheap labour" economic advantage of Third World countries that some predict the failure of economic development policies based on exports. Raphael Kaplinsky of the Institute of Development Studies of the University of Sussex even goes so far as to hope for such a collapse. He realizes the economic growth of a number of Third World countries will be seriously affected in the short term, but sees this as a positive push toward autonomous development and increased trade between developing countries. "Strate-



gies based on exports have all too often gone hand-in-hand with increased poverty and repression," he argues. Hoffman does not foresee such a dramatic impact. He expects that several of the newly industrialized countries will adapt quickly and continue their process of industrialization. The competition between the survivors will be fiercer, especially since those industrialized countries that miss the microelectronics boat will undoubtedly attempt to save themselves by grabbing at larger market shares of the same type of easily manufactured products.

IMMENSE POTENTIAL

In spite of the fact that the microelectronics revolution promises to be as important as the Industrial Revolution that began in England 200 years ago, some heads of state in developing countries ignore its implications. On several occasions in the course of his survey, Hoffman has been told: "This microelectronics technology is so sophisticated; it cannot possibly affect us." Nevertheless, a few countries are attempting to devise strategies to keep themselves in the industrial game.

In 1976, South Korea created KIET (Korea Institute of Electronics Technology) with the help of funding from the World Bank. The aim of KIET was to serve as a catalyst for the development of national potentials in the field of computing hardware manufacture and software design. In spite of the weight of official policy behind this program, Korea has made relatively few advances in the field of integrated circuits and microelectronics. One of the Institute's most important projects, the manufacture of an ultra-sophisticated colour television, seems — according to Hoffman — to have proved a failure. He also notes that the country's potential for research and development in microelectronics remains low.

India, while it has no official development policy with respect to the microelectronics sector, has a great deal of potential. Hoffman was unable to discover any precise policy pertaining to the future of the industry in India, but suggests that "possibly it's the size of the country's human technical resources that explains the vigour of the electronics sector." Each year, educational institutions in India train approximately 1000 electronics engineers and, according to Hoffman, a great number of these engineers specialize in software design. India has a huge pool of qualified systems analysts and programmers — some of which supply industry in the North (see Exodus of skills, page 22).

These specialists are in particular demand since the software component represents a growing proportion of the cost of data-processing systems; in five years, software will probably account for 90 percent of the manufacturing costs. American companies such as Intel and Texas Instruments have already begun negotiating joint projects with India in order to take advantage of this highly skilled labour.

India is also doing extremely well from the standpoint of hardware. For example, the state-owned firm of Bahrat Electricals Ltd., whose main client is the defence

department, is manufacturing its own integrated circuit chips. In fact, of all the developing countries, India is the most advanced in microelectronics, according to Kurt Hoffman, with particular expertise in the most crucial software field.

SMALL IS POWERFUL

The first large electronic computer, ENIAC (Electronic Numerical Integrator and Calculator) hummed into being at an engineering school in the eastern United States in 1946. ENIAC had about 18 000 vacuum tubes, spread its metal bulk over a large room, and drew as much power as a locomotive engine.

Microcomputers and microprocessors today are small enough to fit into a pocket, cost between \$US. 100-300, and can run on small batteries. They are also on the order of 20 times faster and thousands of times more reliable.

The advertising of IBM (International Business Machines) gleefully points out that an equivalent gain in the automobile industry would put the price of a Rolls Royce luxury sedan at about one nickel (\$US. 0.05) in 1981.

The key development was the integrated circuit. Transistors are components of an electric circuit used to amplify, detect, or switch the flow of electrons. Their development in 1947 transformed electronics, as they made vacuum tube circuitry largely obsolete. Efforts to miniaturize transistors for use in military and space hardware led to techniques in which transistors were produced in batch lots in silicon wafers. Further innovation saw the integration of other components of circuitry into the same silicon chips and additional size reductions. As Colin Norman puts it in a recent *Worldwatch* Paper: "In three decades, a roomful of vacuum tubes, wires, and other components has been reduced to the size of a cornflake."

Current innovations continue to pack more and more circuitry onto chips. In 10 years, manufacturers expect to cram more than a million components into their units. With the addition of information processing capacities — computing functions — to silicon integrated circuits, the microprocessor is created.

Instructions on how a microprocessor will shunt electrons within the myriad of circuits, to perform logic functions such as calculation, are established beforehand. Function determines design and manufacture. This is called programming, and it is in the programming of microprocessors to apply their enormous flexibility for handling information that the future of microelectronics lies for developing countries.

It is in the area of software — the programming and use of microprocessors — that other developing countries might best exploit the remarkable potential of the new technology as well.

The diffusion of microelectronics is determined in large part by the cost and nature of the electronic components available from manufacturers. But it will also be influenced by people who couple microelectronics experience with a keen awareness of human needs and invent uses and markets for the technology.

India has a head start. But many of the human resources in technology are drained off to richer countries, where they are employed producing pinball machines and toys, robots to make sophisticated consumer goods, or even missiles and spacecraft.

Applications of importance to developing countries will probably only be realized if those countries develop the necessary software skills. The pinch has already been felt in the global inventories of these skills. Meanwhile, a host of potentially beneficial products for developing countries await invention. They could include:

- a diagnostic tool for rural health care workers, a "doctor in a box" that provides on-the-spot analysis, interpretation, and suggested treatment information;
- control systems for biogas generators, fuel alcohol stills, or single-cell protein fermentors. Such systems could reduce the requirements for technically intensive management skills, and make it possible for widespread adoption of these technologies in rural areas where food and energy are most needed;
- crop management calculators to aid in decision-making on inputs of fertilizers, pesticides, and irrigation; electronic weather vanes for climate information; or devices to alert farmers of ripeness, dryness for storage, or any number of agricultural information needs.

None of these applications are as fantastic as they may seem at first glance. The plunging costs of hardware bring all of these inventions well within the bounds of present capabilities. When radio was first developed, it was thought appropriate only for communications to inaccessible or remote areas — such as ships at sea or in mountainous areas. Yet now, the transistor radio is one of the world's commonest and most widely diffused technologies.

You don't need to be an automotive engineer to drive a truck. But you have to know how to drive and where you are going.

In the same vein, developing countries don't need to construct plants to manufacture silicon chips, or duplicate all the stages of nurturing a microelectronics industry to reap some of the benefits. It would appear that the strategy most suited to the Third World lies in developing the software capacity to apply the technology to its own special needs.

Microelectronics' potential to transform industry and society in industrialized countries presents the poor nations with a dilemma. Either they use the technology themselves for their own benefit, or they will be harshly used by it.



Photo Jack Redden

NORMAN MYERS

# STAND AND DELIVER TROPICAL MOIST FORESTS

**T**ropical moist forests (TMFs) continue to be depleted, whether quantitatively or qualitatively, at ever more rapid rates. A figure widely bandied about during the 1970s suggested that TMFs have been disappearing at a rate of roughly 20 hectares a minute. This is equivalent to more than 100 000 km<sup>2</sup> per year, or an annual destruction rate of 1.1 percent.

A more accurate way of looking at the situation is to approach it through two separate lines of analysis. First, the rate of outright destruction — the complete removal of forest — is, according to a recent report by J.P. Lanly and R. Clement of the Food and Agricultural Organization of the United Nations (FAO), some 10–12 hectares per minute, or a little over 0.5 percent of the biome each year. Second come various forms of gross disruption and degradation that, while allowing a forest to remain, generally leave it severely impoverished. According to a survey conducted by the National Academy of Sciences of the USA<sup>†</sup>, a minimum of 40 hectares a minute, or roughly 2.2 percent of the biome per year, are thus depleted.

In face of this deteriorating situation, there is an ever-growing clamor in certain circles for tropical moist forests to be "locked away" as ecosystems that are too complex and fragile for us to exploit without damaging them beyond recovery. Preserve the lot, they argue, cut not another tree.



But the preservationist option means that a stock of natural resources, ranking among the most valuable on earth, would lie idle. At the other extreme, the established approach — broad-scale exploitation of forests for a few products such as timber and fuelwood — amounts to overuse. So careless are present patterns of exploitation that they have been described by Dr. K.F.S. King, former Director of FAO's Forestry Department and ex-Director-General of ICRAF (International Council for Research on Agroforestry), as "primitive, costly, and wasteful."

There is an alternative, however. Natural resources of the exceptional scale and value of TMFs should be enabled to play

their part in development strategies of the future. Could not the focus of discussion switch away from "destruction" to "development" — development being taken to mean whatever form of "wise use" is appropriate? Why not develop TMFs for all their worth, before they are ravaged out of existence?

## GOODS AND SERVICES

More than suppliers of just board feet of timber and piles of fuelwood, tropical forests provide foods, drugs, fibres, and a vast range of material goods. Moreover, by their mere existence they perform many environmental services: they safeguard hydrological systems, protect soils, maintain ecosystem nutrients, and regulate climates. Through their watershed effects, they ensure regular supplies of irrigation water, thus supporting agriculture, and protect hydropower facilities against erosion-caused siltation. Simultaneously, watersheds ensure dependable supplies of good quality water for domestic households. Forestry thus benefits public health programs.

In these and several other ways, forestry complements rather than competes with leading economic sectors of development. And while few other sectors are as supportive of such a range of activities, seldom has any been so little appreciated.

Equally significant, TMFs supply goods and services for everyone, from specialty timbers — notably hardwoods — for devel-



oped nations, to genetic resources for modern medicines, including drugs to combat cancer, heart disorders, and other medical scourges. They provide germplasm to improve the genetic makeup of temperate zone crops. For example, a perennial form of maize has recently been discovered in Mexico's forests, that, were it to be crossed with conventional, annual varieties of maize, could eliminate the costly burden of season-by-season ploughing and sowing, thereby revolutionizing maize growing. TMFs also abound in raw materials used by a multitude of industries in developed nations. As technological capacity expands, ever more diverse kinds of feedstocks will be sought.

#### DEVELOPMENT: MULTIPLE OPTIONS

The "development" options of TMFs are many. They can include exploitation of the natural forest in conventional fashion for timber or, equally valid, the exploitation of forest ecosystems for less conventional purposes, such as the protection of gene pools and maintenance of watersheds. These forms of exploitation may limit conventional utilization to selective harvesting of low-bulk material products, and they may sometimes require that a forest ecosystem be left virtually undisturbed. But the genetic resources of TMFs are so extensive and diverse that methodical and comprehensive exploitation of germplasm material for agriculture, medicine, and industry could generate high economic returns. It might prove more advantageous to reserve the forest for this type of use than consign it to the axe and chainsaw. Furthermore, a number of countries are now finding that the environmental benefits of TMFs, notably through watershed functions, can be evaluated in millions of dollars.

Biotically speaking, TMFs constitute by far the richest biome on earth. Covering only about seven percent of the planet's land surface, they harbour 40–50 percent of its 5–10 million species. They offer many thousands of new foods, such as the protein-rich winged bean. Virtually unknown outside its native Papua New Guinea until a few years ago, it is now grown in more than 50 countries. The forests are also the world's main repository of naturally occurring medicines, including over 2000 plant species believed to possess potential anticancer properties. In 1960, a leukemia sufferer's chances of remission were one in five; now, thanks to a drug developed from the rosy periwinkle — a TMF plant — victims' chances are four out of five. Commercial sales of this drug worldwide now approach \$US. 50 million a year. A small shrub of Asia's forests, the Serpentine root, relieves hypertension; this first modern tranquilizer generates sales worth \$60 million annually in the United States alone.

For industry, TMFs yield a host of specialist materials — latex, gum, camphor, damnor, resins, tannins, exudates, dyes, ethereal oils, and biodynamic compounds.

So plentiful and varied are the organic feedstocks of TMFs, that certain foresters now perceive a potential for "forest industrial complexes." Lignin, available in manifold forms among the extraordinary diver-

sity of TMF trees, is increasingly utilized in the manufacture of plastics, ion-exchange resins, rubber reinforcers, fertilizers, vanillin, emulsions, asphalt strengtheners, ceramic processes, and dispersants for oil drilling. From cellulose are produced rayon and plastics, phenols, furfural, and formaldehyde. "Wood engineering" (the synthesis of various wood components — particles, fibres, strands, flakes — with non-wood components) points the way to entirely new categories of products, already numbering more than 3000.

Innovative approaches could encourage TMF exploiters to make more efficient and systematic use of forest resources. In light of the known possibilities, let alone the many more that are yet to be identified, TMFs could eventually shelter industrial centres where manufacturing and processing industries would utilize thousands of kinds of raw materials harvested in a surrounding glade of relatively undisturbed forest.

The TMFs perform many environmental services without human exploitation. Through control of soil erosion, they prevent the silting up of water reservoirs, irrigation systems, and hydropower installa-

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*Forests are resources  
that can yield  
many returns — if they survive  
the present abuse*

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tions. Huge dams in the Philippines, Pakistan, Ecuador, and Colombia are now estimated to be losing their capacity within half their project lifespans. The sedimentation of the Ambukao Dam in the Philippines caused a water crisis in major urban communities in 1977, notably in Manila, and typhoon damage, aggravated by deforestation-caused floods and landslides, now amounts to \$20 million per year. As a result, President Marcos has declared that the decline of the Philippines' forests constitutes a "national emergency". According to an expert on environmental hazards, Prof. Robert Kates of Clark University (Massachusetts, USA), floods and typhoons, together with other natural disasters such as droughts, claim the lives of 250 000 people each year, 95 percent of them in the developing world. A good number of these lives could be saved by better safeguarding of forest cover.

There is a wider dimension to the deforestation/water supply problem. According to the 1977 UN Water Conference, the amount of land scheduled for irrigation in the humid tropics will continue to expand for several decades, eventually covering some 1700 million km<sup>2</sup>, or almost 60 per-

cent of irrigated cropland on earth. In Asia, where potential irrigated areas are in the most heavily populated countries, water needs for agriculture alone are expected to catch up with stable seasonal river runoff by the year 1990. The same will occur in much of West Africa and Central America by the turn of the century. Moreover, as developing countries undergo urbanization, their per capita consumption of water increases rapidly. These countries will become increasingly dependent on assured supplies of year-round water. Unless TMFs are exceptionally well conserved, water supplies will soon fall short of demand. Given these needs, the safeguarding of watersheds is as legitimate a form of development as timber harvesting.

#### TMFs IN THE FUTURE

There is a final dimension to the challenge of development for TMFs at the start of the new international development decade. The economic, social, and political environments of TMFs are today far different than in 1970. During the past decade, TMFs have been exploited more widely than in several previous decades put together. The 1980s present a fresh set of problems and opportunities.

For one thing, certain aspects of forestry planning cannot be confined to individual countries. During the June 1978 monsoon, floods in India's Ganges Valley caused an estimated \$2 billion damage. Deforestation, not only in northern states of India, but in neighbouring Nepal as well, was responsible. This international dimension of the misuse and overuse of TMFs, seldom considered in 1970, may become all too common in 1990 as almost 100 watersheds in TMFs span international boundaries.

Still more important, increased prices for petrochemicals are causing the world's chemical industries to seek alternative sources of feedstocks. Hitherto, the manufacture of many phenols, polymers, and a host of other products depended on fossil fuels: 97 percent of materials for synthetic chemicals, worth \$300 billion per year, have been derived from petroleum. The organic diversity of TMFs and their vast stocks of phytochemicals may well be the best alternative source of raw materials.

So 1990 could see tropical moist forests being tapped for a range of innovative products that rarely appear in present-day exploitation patterns. Notable items for the future could include new varieties of existing food crops, completely new food species, and new forms of foods such as leaf-fractionated protein, as well as organic raw materials for chemical industries and many other products of exceptional value. "Wise use" along these lines could enable a patch of forest to yield goods whose financial value would far surpass those presently harvested. □

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<sup>t</sup>Conversion of Tropical Moist Forests, published by the National Research Council, Washington DC, USA, April 1980.

Dr Norman Myers, a Nairobi-based consultant in environment and development, is the author of *The Sinking Ark*, published by Pergamon Press (Oxford, UK and Elmsford, NY, USA).



*The struggle between conservation and exploitation  
comes to a head in the Amazon River Basin*

# AMAZON ROULETTE

## DESTRUCTION OR DEVELOPMENT?

DANIEL VIDART



Photo: Ron Poling

**T**he Amazon River Basin's territory of more than 700 million hectares is shared by six Latin American countries. But although it was scarcely utilized due to its relatively poor soils, high population density in some areas of the Amazon basin countries is now forcing the migration of agricultural settlers to the jungle, and various development plans are being formulated — and implemented — to exploit the region.

The slash-and-burn cultivation practiced by these "spontaneous settlers" may be ecologically stable under low population pressures. During the last two decades, however, an increase in population has been producing an alarming expansion of the areas of forest destroyed which, combined with shorter fallow periods, is resulting in significant damage to the ecological

system. In the central jungle of Peru alone, it has been estimated that, each year, some 3000 new settlers destroy 20 000 hectares of natural forest.

Various ecologists are predicting disaster should the destruction continue, not only for the Amazon itself, but also for the rest of the world as tropical moist forests are a significant source of oxygen. But those who would fight for turning the Amazon into a sanctuary cannot ignore the increasingly desperate efforts of Amazonian countries to develop their economies and societies in order to satisfy the basic needs of their people. They do not advocate "conservation", a term which originated in French forestry legislation of the 19th century to describe rational exploitation, but rather, the closed reserve, *hortus conclusus*, whereby the forest would

remain untouched and untrod, preserving its fragile equilibrium and the glories of its flora and fauna. For them, any incursion into the tropical rain forest would be tantamount to destroying the forest itself and, by necessary extension, the human settlements it harbours.

On the other hand, the undeniable problems of survival faced by vast sectors of the Amazonian population of some 5 million inhabitants will not be solved by frenzied development that, in the short term, could mean the collapse of entire ecosystems, converting this awesome landscape into a desert of lateritic soils and obstructed riverways.

What, then, are the alternatives? Should we press for the restoration of an "enlightened Neolithic age" throughout the world, or shall a shattered biosphere be replaced by a cybernetic technosphere? Do we encourage the enduring presence in our world of Amazonian hunters and farmers living in harmony with their land or the violent plundering of the forest's wealth?

### AMAZONIA

First and foremost, it must be realized that Amazonia is not a unique phenomenon in our world. Similar hot, steamy, rain forests cover, or at one time covered, vast expanses of Borneo, New Guinea, Indonesia, northern Australia, Indochina, parts of India, Ceylon, Madagascar, central and western Africa, some areas of Central America, and of Colombia. However, because of its enormous surface area and the singular characteristics of the river and basin, Amazonia attracts the lion's share of world attention.

Nor is there one Amazonian ecosystem, in spite of rather careless statements to the contrary, although the region is not as vast as some authors would have it when describing nine different biogeographical "provinces" within its territory. In studies restricted to the *Hylea* or forest zone of the Amazon basin, three ecosystems are identified: the *terra firme* — solid ground; the *varzea*, swampy areas along the river banks that flood during the rainy season; and the perpetually waterlogged *igapos*, fed by "black water," "white water," and "clear water" rivers, each representing an aquatic ecosystem which in itself is worthy of further study. The ecosystems of the total Amazon, are far more complex than this, however, and have yet to be thoroughly studied and classified.

We must view Amazonia, then, as a geographical plexus, a common denominator that embraces such diverse formations as the tall forest, covering 70 percent of the surface area, clumps of *cipolo* brushwood and flat plains, the periodically-flooded *varzeas*, and the perpetually submerged *igapos*.

In short, Amazonia is a vast expanse of flatlands covered with different types of forests and savannahs. All of it is practically at sea level: from Iquitos, on the Peruvian border, until it joins the ocean, the Amazon river drops only 65 metres. The plentiful animal life in the forest is concentrated 50 metres up and sometimes higher. The forest floor, that shadowy habitat of shade-seeking vegetation, is surprisingly clear of thickets and undergrowth, and few



birds or mammals intrude on this, the headquarters of the jungle's rich insect life. The soft, constant trickle of nutrients released by the soaked foliage enriches the soil with potassium, magnesium, phosphorus, and other oligoelements. Here, then, is the secret alchemy of the rain forest: the nutrients that cannot be provided by the subsoil are filtered by the arboreal umbrella from the heavy rain which, depending on the area, may vary from 1500 to 3000 mm annually, by a continuous litter fall and absence of leaching.

The soil is generally poor and lacking in minerals, but the constant rainfall and average temperatures of 25°C, with only 3°C variation between the hottest and coolest months, help the forest to salvage such meager nutrients as can be recycled in its intricate photosynthetic laboratory and labyrinthine root networks. In the gigantic vegetation of the *Hylea* we see towering strength born of fragility, the ingenious exploitation of meager resources in impossible conditions.

### THE CONTROVERSY

The awareness of the economic and social development that is sorely needed if living conditions of more than half the world's population are to improve and the further realization that most of these unfortunates inhabit the tropical zones of the earth, has given rise to a passionate controversy over the development of tropical and equatorial forests.

Amazonia cannot help but play a key role in any such discussions because it lies at the very heart of the controversy. Two opposing camps have been defined — the ecological versus the economic, their extremes tempered by several intermediate stances aimed at arriving at regional or economic compromises.

For the members of the ecological camp, no matter what arms and arguments are deployed by science and technology, Amazonia, with its complex network of fragile ecosystems, cannot now and will at no time gracefully incorporate the advances of modern civilization — intensive agriculture and cattle-raising, high-density urban and rural settlements, roadways, and industrial development. Specific reasons have been advanced by many specialists to explain why such a transformation would be difficult.

First, Amazonia is an "illusory paradise". Its highly acidic soils, laced with laterite and practically devoid of humus because of the relentless heat, would be quickly destroyed under the direct impact of rain should the arboreal canopy be removed. Thus exposed to the burning rays of the sun, the soil would bake as temperatures rose swiftly from 18° to 40°C and higher, until it became as hard as rock. When broken up by ploughs or hoes in preparation for planting, the soil quickly erodes, muddying the river waters, damaging aquatic life, and contributing to sedimentation downstream.

Second, the tree species growing in the area are of limited commercial value. The hardwoods that could be profitable are very widely scattered, making the transportation of logs and other forest products slow and unwieldy.

Also, endemic diseases, while tolerated by indigenous populations, are the scourge of potential colonizers, particularly as preventive medicine or medical care is not available.

For the preservationists, any attempt to exploit the supposed riches of these ecosystems can only be described as Amazon roulette. The destruction of existing ecosystems would upset all manner of delicate ecological balances and would entail the irreversible destruction of an enormous source of oxygen which is crucial for the survival of the biosphere.

The economic thesis, defended mainly by Brazilian politicians and administrators, is summed up in phrases like: "Only rich countries can afford ecology: we have other priorities" and "Pollution control is expensive, and we're a poor country". As a persuasive exponent of the Brazilian position put it: "It is not so much a question of striving for ecological equilibrium as an attempt to identify the most effective strategy to achieve long-term ecological disequilibrium."

Those for whom the destruction of Amazonia is a necessary first step in its transformation argue that while the *terra firme* soils may indeed be poor, the 60 000 square kilometres of *varzea* swampland flanking the river are nurtured, like the ancient Nile, by the sediment and nutrients deposited by the floodwaters of the "white water" rivers from the foothills of the Andes. The hot climate and heavy rainfall should guarantee favourable conditions for subsistence and even commercial farming, provided appropriate methods and fertilizers are used. Profitable cattle-raising ventures would also be feasible if tropical grass was planted, certain breeds of cattle refined and adapted, and strict sanitary controls imposed (see box).

Furthermore, the year-round solar radiation would ensure highly productive agrosystems and offers a plentiful, inexpensive source of energy for domestic and community needs. The rivers, if properly harnessed, also could provide electric power for human settlements and serve as excellent communication systems, once waterways are dredged, canal systems and floating piers devised, etc. Roads could be opened up in those areas where transportation by water is not feasible.

It is further argued that reforestation policies can be designed to replenish forest areas which have been cleared, and that the health risks can be averted with medical care, hygiene, and good nutritional habits, clearing the way for human settlements.

*As the two camps marshal their arguments, parts of the Amazon are falling under the axe. Norman Myers reports that in Brazilian Amazonia, at least 78 000 sq. kilometres of rain forest have been turned into ranching enterprises. The reasons behind this destruction and its consequences will be presented in Reports Vol. 10, no. 2, July 1981.* □

*Daniel Vidart, occasional Unesco consultant and professor of the National University of Columbia, is the author of numerous works dealing with the environment, development, and ecology.*

## THE NEW PIONEERS

The Amazon jungle is the major hope for the future of Peru's 16 million inhabitants, and in 1978, a law was passed for the agricultural development of the area through the organized establishment of new settlers. Many alternatives have been suggested for the economic utilization of the jungle and various commercial crops such as oil palm and black pepper show considerable promise.

Livestock production based on pastures is one of the most interesting possibilities for marginal lands, however, as it requires few capital inputs. Pastures also provide good protection against soil erosion and may improve fertility. A shortage of beef and dairy products in Peru would also ensure a ready market for the products.

One of the institutions that has done the most work in animal production research in the Amazon is the Veterinary Institute of High Altitude and Tropical Research (IVITA) of San Marcos University. Researchers there have now identified the main problems and potential for animal production in the region. For example, they have demonstrated that the replacement of forest by poorly managed pastures breaks the natural fertility equilibrium of the soil, decreasing its level of productivity. They believe, however, that production advances are possible with the development of better grass and legume combinations and improved management, without having to increase the level of inputs.

IVITA's scientists have also demonstrated that with a modest increase in technological inputs — fertilizer, better grass species, and controlled grazing — it is possible to restore degraded pastures.

With IDRC support, IVITA is now developing economical and ecologically stable systems of pasture development and management for cattle production. The first stage will be an integrated "pioneer" system for new settlers, designed to be implemented as soon as the forest is cleared, before soil fertility decreases. It includes preventive health practices as well as forage conservation techniques.

IVITA believes that within 6 to 10 years after the pioneer system is introduced, the settlers will have acquired enough experience and capital to initiate a slightly more complex system of management, requiring greater inputs, which would increase the productivity of already degraded pastures and thus their incomes.



## Perpetual corn

The discovery of a primitive relative of modern corn that regrows year after year from a single planting holds the promise of a major breakthrough in boosting world production of this important food and feed grain.

The plant, *Zea diploperennis*, has thick root-like stems (rhizomes) that remain in the soil to generate roots and stems from year to year like other perennials. Corn as it is now known is an annual, and must be reseeded every year.

Dr M.R. Guzman, of the University of Guadalajara in Mexico, and colleagues found the plant growing wild in a remote mountainous area of west central Mexico. Although a very distant relative, it shares the same genetic characteristics as modern corn, making crossbreeding possible.

In addition to its regenerative qualities, *Zea diploperennis* appears to tolerate or resist four of the seven major viral diseases of corn. It also grows on wet soils and at high altitudes — habitats now beyond the reach of conventional corn.

Reporting the find in *New Scientist* magazine, environmental consultant Norman Myers points out that future corn production might become simpler, cheaper, and more bountiful with the introduction of the perennial's genes. Corn already accounts for one-quarter of world grain production, and is one of the most important food crops in developing countries.

## Report card on housing

The final word is in on sites and services housing projects in El Salvador, Senegal,

Zambia, and the Philippines. An evaluation of the World Bank low-cost shelter projects, jointly funded by the Bank and IDRC since 1975, ended in November 1980. The verdict:

- Sites and services and squatter upgrading projects increased the national production of low-cost housing by up to 50 percent. The houses were of higher quality than expected, and families continued to invest time and money in improving them and community facilities.

- The middle classes have tended to move into the projects. Interestingly, it was found that income distribution in squatter settlements was the same as in the project sites, indicating that low-cost housing is not just sought after by the poor.

- Income and employment were generated during the construction process in substantial amounts, as was rental income after construction. The researchers now realize that subletting the houses may be one of the most effective ways for the poor to increase their incomes, thus making the projects more affordable.

- The administration of loans proved difficult. "On site" stores supplying materials to borrowers often did not have the needed materials, nor were they necessarily cheaper suppliers. It is recommended that families be allowed to use the borrowed money to purchase materials from the best source, and to hire labour. The self-help labour aspect did not prove very popular or economical. It has also been difficult to recover the loans.

The projects have demonstrated that the "progressive development model," where-

by families assume part of the cost and responsibility for the construction or upgrading of their house, produced cheaper and better quality housing than conventional methods. Improvements also were found in the provision of water, sanitation, and other services.

A summary of the main findings of the evaluation can be obtained from DEDRB, World Bank, 1818 H St. N.W., Washington, DC 20433, USA.

## See the show — get the message

Villagers in many parts of rural Asia who turn out to see traditional forms of folk entertainment may well be getting more than they bargained for. In most developing Asian countries the folk arts have become vehicles for development messages as well as entertainment and culture.

Folk music, dance, and drama have always been used to convey messages. Traditional beliefs and values are passed on this way. So why not add some "contemporary themes" to pass on national development news and encourage people to help themselves and their country?

The technique is used in many ways — to promote rural community development, family planning, or a new strain of wheat or rice. It is used in the *Wayang Kulit* shadow plays of Malaysia, and the *balitao* musical performances of the Philippines, where studies have shown their effectiveness in communicating to the rural people, regardless of sex, age, education, or income.

Similar studies of India's rich culture show that as many as 600 different folk forms have been used to

carry development messages. In Bangladesh, the government has gone so far as to establish an organization called Mass Communication Through Music. And in Sri Lanka, folk theatres are widely used for development communications.

## Year of the handicapped

One person in 10 suffers a physical or mental handicap. Of the 450 million people in the world today who are disabled in one way or another, fully 80 percent are in developing countries. Yet the handicapped in developing countries receive only 10 percent of the resources expended to aid the disabled.

The United Nations has proclaimed 1981 the International Year of Disabled Persons, and hopes to draw attention to the needs and aspirations of people with mental or physical impairments. Simply focusing attention on the handicap may be a useful exercise in itself. Fifty percent of disabilities — those caused by accidents, malpractice during birth, malnutrition, or drugs to name a few — can be prevented by informed action.

In a joint statement launching the Year, the heads of the World Health Organization (WHO) and the United Nations Children's Fund (Unicef) expressed the wish that it is the right and duty of all of us to ensure the full and equal participation of the disabled in our society."

## Troubled waters

Fishermen in some developing countries are abandoning their hooks and lines in favour of dynamite and poisons in a desperate attempt to keep their own heads above water.



Caught between rising fuel prices and the increasing protein demands of populations, fishermen in Thailand and Nigeria are resorting to crude and self-defeating methods to tear more fish from the water, according to reports in the newsletter of the International Centre for Living Aquatic Resources Management.

A near doubling of fuel prices in Thailand has forced small- and medium-scale fishermen to work coastal waters more intensively, rather than venture to new grounds further away. They resort to destructive gear such as fine nets, explosives, and poison as their incomes are squeezed by rising costs and falling catches. Ultimately, the whole fishery is endangered as young fish are killed along with the mature, leaving nothing to replace stocks.

The situation may be worse in Nigeria, where local poisonous herbs as well as chemicals and explosives are used to strip inland river basins and flood plain ponds. These practices are doubly dangerous in Nigeria because they pollute waterways that are the source of drinking water for the majority of the people in these areas, and send fish to market dosed with chemical residues.

Researchers studying the problem in Thailand recommend fixing quotas on the number of vessels permitted to fish coastal waters and then regulating the market. Nigeria may follow a strategy of control that educates fishermen to appreciate the harm involved in present methods, and organizes cooperatives to improve conditions for conventional fishing operations.

### **New attack on snail fever**

The prospect of lifting the health burden of a chronic, debilitating disease that strikes up to 200 million people in developing countries is a little brighter due to a new drug treatment developed in the USA.

Ernest Bueding, a biochemist and pharmacologist at Johns Hopkins University, has taken a drug originally developed as a hookworm treatment and combined it with an antibiotic to produce an apparently safe and effective weapon against schistosomiasis (or bilharzia, see *Reports* Vol. 9 no. 1). Schistosomiasis is caused by a parasitic blood worm that damages the liver, bladder, and intestines of infected hosts.

The drug, amoscanate, has been used with success in China against schistosomiasis. However, Bueding discovered that it produced cell mutations in animals, indicating a potential cancer risk. Combining amoscanate with the antibiotic erythromycin eliminated the mutating activity without diminishing effectiveness against the disease.

Providing the drug proves effective and safe for treating humans, it may ultimately be possible to deliver at a cost of only one dollar a dose.

### **Leucaena: better than ever**

Leucaena, the fast-growing leguminous tree that is the object of considerable research to exploit its abundant animal feed and fuel potential, has added another use to a growing list — protein for human consumption.

John Raintree, of the Inter-

national Institute of Tropical Agriculture, reports that leucaena seeds are used in Java to produce *tempe*, a fermented, curd-like cake high in protein. *Tempe* is a foodstuff thought to have originated in Java as long as 2000 years ago. *Tempe* (and its cousin *tofu*) made from soybeans is a popular meat substitute throughout Asia.

Although young green leucaena seeds are consumed as a vegetable in Asia and Latin America, Raintree says that it is only in a small hilly area in the south of central Java that the mature, hard, brown seeds are processed into *tempe*.

The seeds are boiled and dehulled, then steamed and put out in the sun to partially dry. A starter, made of ground-up portions of a previous batch of *tempe* containing the necessary fermenting microorganisms, is added to the leucaena mash. Wrapped and placed in a warm place for two days, the mixture sets into a dense cake.

An analysis of dry leucaena *tempe* revealed that it contains 50 percent protein, 38 percent carbohydrate, and 11 percent fat. Raintree suggests that "the flavour and nutritional quality of leucaena *tempe*, together with the high yield potential of weedy leucaena varieties on marginal land in the tropics," would more than justify efforts to develop improved processing techniques.

### **Status of children**

How fare the world's children? Not well, according to James P. Grant, Executive Director of Unicef, in his 1980 report, *The state of the world's children*.

Of the 122 million children

born during the International Year of the Child (1979), 10 percent are now dead, the victims of "absolute poverty". A further 20 percent will die before their fifth birthday. Only half will learn to read and write. Less than 10 percent will be immunized against common diseases or have access to health care.

But things could be much better. By the year 2000, all countries could achieve an infant mortality rate of less than five percent, an average life expectancy of 60 years, and a literacy rate of 75 percent. The evidence that these targets can be reached exists, says the report, in the example of countries such as the People's Republic of China, Sri Lanka, and the Indian State of Kerala, that have achieved dramatic progress without a significant increase in GNP or per capita incomes.

Drawing on these examples, the report proposes strategies for reaching the goals. Most important is primary health care through community health workers. On the food front, the report claims that the "major lesson of the last 20 years is that reductions in malnutrition cannot be achieved only by increases in food production . . . Distribution is the mechanism which seems to have failed." The third factor is primary education, described as one of the most productive investments that any low income country can make.

An increase in aid will also be required as will its re-direction toward the poorest countries. Unicef's priority for the next two decades is to demonstrate that progress can be made, and that the worst aspects of poverty can be eradicated.



# CLEAN WATER FOR ALL

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*A tool to break the poverty cycle*

"Clean water for all" is the goal of the UN International Drinking Water Supply and Sanitation Decade that begins this year. It is no easy task: to provide 100 percent coverage by 1990, half a million people a day for the next 10 years must be given water supply and sanitation facilities. The estimated cost is \$US. 25-30 billion annually.

By itself, clean water is not enough, however. People must learn basic hygiene and how to use standpipes, pumps, and latrines, as well as how to maintain the equipment. This is where many water supply and sanitation programs have floundered in the past. The "build it and leave it" approach falls flat. In India, for example, half of the handpumps installed in rural areas are out of order. In Accra, the capital of Ghana, a \$3.5 million sewerage system serves less than 200 homes after 10 years of operation.

Cheap, reliable, and effective technologies will need to be designed if the decade's goals are to be reached. As our photos illustrate, a number of IDRC-supported projects are attempting to do just that.

Changing the attitude of some governments is also essential. If the UN and other agencies now see clean water as a tool for breaking out of the cycle of poverty, many Third World governments do not. Some still prefer to spend more on hospitals to cure illnesses than on clean water to prevent them. And yet, many water-related diseases such as bilharzia, onchocerciasis, and trypanosomiasis are difficult to treat, particularly in rural areas where health facilities and personnel are few.

A not inconsiderable benefit would also accrue to women and children who spend long hours in back-breaking labour carrying home cans and jars of water. For them the decade holds out the promise of freedom from tedious work as well as freedom from disease.

Most water experts do not hold out much hope that everyone will have clean water by 1990. The new UN decade should, however, ensure a concerted and concentrated push toward meeting that very basic need. □







*"Water is essential to life, and civilization is something of a dialogue between humans and water." Indira Gandhi*



Opposite page: Getting water often means a long haul once or twice a day for women and children, as here in Nigeria. This page, clockwise from top: These Afar children in Ethiopia are among the lucky — they have fresh water from an experimental plastic pump that lifts it from beneath the desert. "All-purpose" water sources used for washing, cooking, and drinking create disease problems. A watering station in Botswana: water is essential to rural livelihood, too. People must have water and, if there are no alternatives, take it wherever they can find it.



**V**ery early in its life, IDRC's Governors realized that they had to be selective about its priorities. They decided, therefore, that IDRC should emphasize that section of its mandate which calls for developing countries to be assisted "to build up the research capabilities, the innovative skills, and the institutions required to solve their problems." With this focus, the Centre's approach has been to seek to ensure that the need to conduct research, the capacity to undertake research, and the research process itself are melded into a whole in developing countries.

Whatever final assessments are made of IDRC-funded research, the Centre's activities have already resulted in establishing a place for research in the development process. This is a remarkable achievement, because in many developing countries the research community has been considered remote from the hurly burly of pain and growth. In some countries, the research community itself sometimes gave the impression that it was desperately trying to substantiate the accusation. IDRC is helping to change these attitudes and orientations.

As a complement to its primary focus, it also sought the assistance of Canadian researchers where such assistance was expected to enhance the work of developing country researchers. As of last September, IDRC had funded 67 development-related research projects in Canada. Approximately half were in agriculture and related sciences. Thus, cooperation has been established in many fields between universities in Canada and institutions in developing countries. Several Canadian scientists have been associated with a network of developing country projects over a long period. Some Centre staff have been located at Canadian universities, and young developing country researchers have been able to improve their skills through fellowship programs in Canada.

While the Centre's primary focus remains unchanged, the opportunity for greater involvement by the Canadian research community in international development and cooperation has now been provided. At UNCSTD (United Nations Conference on Science and Technology for Development), in August 1979, Canada responded affirmatively to the proposal for cooperative programs called for in the Vienna Programme of Action by announcing that "the Government of Canada has decided to adopt a policy encouraging the application of our domestic research and development capabilities to the solution of problems of the developing countries. The Government has specifically stipulated that such Canadian resources should

## COOPERATIVE PROGRAMS LAUNCHED

ERNEST COREA

wherever possible be applied through cooperative or joint research and development ventures with organizations in developing countries or regions with the aim of enhancing their indigenous capabilities."

Later, the Government invited IDRC to serve as the focal point of the new activity. After careful deliberation, the Centre's Board of Governors accepted the invitation, on the understanding that the proposed new activity would be additional to established program activity, but should maintain the principle of responsiveness to developing-country needs.

### EXPLORING RESEARCH LINKS

On December 8 and 9, 1980, IDRC and Simon Fraser University co-sponsored a seminar on "Research for Third World Development", in Vancouver, Canada. The aims were to provide the research community in the provinces of Alberta and British Columbia with information on IDRC, and to share information on the two provinces' actual and potential research capacity for collaboration with Third World research institutions.

Divided into workshops, the more than 150 participants from universities, colleges, government and private research centres explored research carried out in various agricultural areas such as aquaculture, postproduction systems, and farming systems; in information-sharing; in training for Third World research; in social sciences; and in health fields such as fertility regulation methods and rural health care delivery.

Similar seminars are being planned for the Atlantic provinces and Quebec later in 1981.

A Cooperative Programs Unit has been set up as part of the IDRC President's office, and preparatory work has been going on so that research linkages could be set in place as soon as funds are available in April 1981. The figure of \$Cdn 12 million mentioned by Senator Martial Asselin at UNCSTD was a target toward which, one presumes, the Government of Canada will move. The amount available for cooperative research projects in 1981/82 will be relatively modest: \$1 million.

The opportunity for the Canadian research community to be directly involved in development-oriented research arises from the assurance of annual funding earmarked for this purpose. The challenge to the Canadian research community is to ensure that collaborative research is truly collaborative in scope, substance, and form. The advantage to developing countries is that they will have an avenue through which their requirements can be matched with Canadian expertise. To ensure that these strands are interwoven, the new activity will not be restricted to the Centre's established program areas, but could be extended to other areas.

Proposals for cooperative research have already been made by institutions in, for instance, St. Lucia-Barbados, Kenya, Ethiopia, and Malaysia. Some have established contact with Canadian counterparts, and their proposals have been jointly formulated. In other cases, developing country institutions have stated the nature of the problem they wish to address, described both the availability and the inadequacy of local staff and facilities, and have asked whether they could be helped to find Canadian partners. Canadian institutions could also take the initiative, in which case it will be IDRC's responsibility to determine whether Canadian and developing country perceptions are compatible, and whether the project envisaged will be designed and carried out in a truly cooperative manner.

William Tossell says in *Partnership in development* (see following article): "Most of the scientific capacity, and in particular most of the very specialized expertise and equipment, existing in the world today is located in developed countries. An important question is the extent to which this expertise should be utilized to assist developing countries . . . At present it is underutilized." At least as far as Canadians are concerned, that situation can now change, and Canadian researchers can be more directly involved in processes that can be as exciting as they are professionally rewarding. □

*Ernest Corea is Director of the Cooperative Programs Unit at IDRC. This article is extracted from a speech made at Simon Fraser University (see box).*

## CANADIAN UNIVERSITIES AND WORLD FOOD

BOB STANLEY



least the next decade the developing countries need to draw upon the resources of countries like Canada for an important part of their graduate training needs."

Outlining the involvement of 33 Canadian universities in development project activity between 1968 and 1978, the report shows faculty members participated in 364 separate projects, either directly or as advisers. There was a five-fold increase in such activities during the 1970s, in spite of a decrease in recent years in the number of projects involving CIDA (Canadian International Development Agency) and IDRC. Most of this project activity was related to the low- and middle-income, food-deficit countries, the report adds.

Dr Tossell acknowledges, however, that the universities' contribution to development in the 1980s will be "greatly influenced by the working relationships that are created between the universities and CIDA, the universities and IDRC, and the coordination among the three."

Faculty members and university administrators, he says, repeatedly cite "difficulties and frustrations" in working on CIDA projects. These are in part a result of the complexity of food systems projects, but also reflect structural, administrative, and

personnel problems within the Agency, says the report. Lack of specialist expertise and high staff turnover are given as examples. One current project experienced no less than three CIDA project officers in its first year.

But Dr Tossell has praise for CIDA's ongoing efforts at reorganization to solve many of these problems. The establishment in 1979 of a CIDA-Universities Coordinating Committee is seen as "an important step", as is the establishment of a universities unit within the Agency's Special Programs branch. And the report commends CIDA for its "serious participation" in the newly-created Liaison Committee for International Development, comprising senior staff of CIDA, IDRC, and the universities, and providing an opportunity for "input and discussion at a level close to the policy decision level."

Turning to IDRC, the report says that when the Centre was established the university community looked forward to the opportunity of participating, and has in fact played a part in 73 projects to date. However, few new projects had been initiated in the past three years. "The trend is clearly toward less participation by universities in project implementation and, if this continues, in two or three years participation will be relatively insignificant. The main question faculty ask is why there is so little opportunity for Canadian faculty to participate in IDRC activities."

Dr Tossell hastens to add that IDRC has "quite correctly" placed its emphasis on the development of the research capability of the developing countries. But he questions whether the Canadian universities "are being utilized adequately by the world system of research in its attack on the provision of the basic human need: food." IDRC, he adds, is in a position to utilize the Canadian universities more fully if it chooses to do so, and he suggests that the Centre study the question thoroughly.

The 145-page report was published at about the time the Centre announced the establishment of a Cooperative Programs Unit (see facing page) aimed at giving developing countries greater access to the research and development capacity of Canadian institutions. And, later in the year, Dr Tossell was among the university participants at a symposium on Canadian agricultural research priorities hosted by the Centre's Agriculture, Food and Nutrition Sciences Division (see following article). □

Partnership in development, Science Council background study 45 (*Catalogue No. SS21-1/45E*) is available from Canadian Government Publishing Centre, Hull, Quebec, Canada K1A 0S9. Price \$Cdn 6 in Canada, \$7.20 elsewhere.

Canadian universities should be concerned about the global food problem, they should be deeply involved in food-system development assistance, and they should establish clear priorities to ensure that such assistance will continue in spite of the heavy demands on the limited resources of the university.

To make the best use of their scarce resources, faculties and colleges of agriculture and veterinary medicine should also consider forming a consortium to coordinate their development-related activities, and establishing networks in specialized areas based on present links, such as those between the University of Alberta and IDRC in the postproduction sector.

These are some of the recommendations contained in a recent study published by the Science Council of Canada, *Partnership in development: Canadian universities and world food*. Prepared for the Council by William Tossell, Professor of Crop Science and Dean of Research at the University of Guelph, the report assesses the contribution of Canada's universities over the past decade, examines the roles of other institutions involved, and maps out a strategy for the next decade.

The most direct form of involvement of the universities in development is in the training of students from Third World countries — about half the foreign students in Canadian universities in 1978 were from developing countries, and about half of these were from the low-income countries, the report states.

But Dr Tossell does not recommend increasing such programs. It is more appropriate for students to learn in their own regions, he says, than to spend up to eight years studying in a developed country, with the inevitable problems of readjustment upon return to the home country.

"If a developing country does not have suitable university undergraduate programs available locally or regionally, the resources of the Canadian universities would generally be better used to assist in building this local or regional capability than in training the undergraduates in Canadian universities," he writes.

But the report adds that there are some situations in which undergraduate training in Canada is appropriate. It cites an arrangement between IDRC, the National Agricultural Research Centre in Bambey, Senegal, and Laval University in Canada, under which Masters level students from six Sahelian countries were able to do course work at Laval and thesis research at Bambey.

Such innovative methods may well be more appropriate than conventional methods, says Dr Tossell, adding: "For at



# PROSPECTING FOR RESEARCH GOLD

Canada can draw on its own experience in agricultural research to benefit semi-arid farming abroad

MICHELLE HIBLER AND BOB STANLEY

**I**f you can create an attitude in Canadian scientists of helping developing countries and training others, then you have a gold mine." That is how Dr S. Quasem, Dean of the University of Jordan's Department of Food Science and Engineering, voiced his hopes at the close of the Canadian Agricultural Research Priorities symposium sponsored by IDRC, in Ottawa in November 1980.

The 50 or so Canadian and developing country scientists and IDRC staff participating in the symposium spent two days discussing which veins of that gold mine should best be exploited in aid of agriculture in the semi-arid tropics. From reports on Canadian competence in various areas prepared by scientists for the meeting, specific recommendations were made on areas for cooperative research in agriculture, postproduction systems, forestry, and aquaculture.

To date, the potential of Canadian institutions to mount a significant research effort in several areas of importance to developing countries has been only lightly tapped. But as Dr R.C. McGinnis of the University of Manitoba points out: "The payoff from a sustained research effort would be directly proportional to the size of the program", and benefits would accrue to Canadian agriculture as well.

## CROPS

Crops, particularly food legumes, are a promising avenue for cooperation. According to Dr McGinnis, the present yield plateaux of a number of these crops is largely due to the little research attention they have received as compared to cereals. A recent report by the Canadian Agricultural Research Council, for example, sets the total research effort on pulse crops in Canada at a mere 27.4 person-years annually.

The working group on legume yields agreed that, in view of the importance of grain legumes, the total research effort has been woefully inadequate. And although good research facilities exist, the supply of the most important element — the scientists — has not kept pace with demand.

Canadian institutions, with well equipped laboratories and excellent field and controlled environment facilities, have the capability to undertake projects in pathogen control, physiology, plant breeding, and genetic studies. Both Canada and developing countries would also benefit

from research on nitrogen and phosphorus fertilization (see *Self-fertilizing crops*), particularly as large areas of Canada have acid soils similar to those in parts of the semi-arid tropics. Selecting and breeding tolerant cultivars seems to hold the best promise for improving yields in these soils.

Tissue culture work (see *Goodbye, birds and bees*) offers a promising approach to

plant breeding research and is an area where Canadian researchers have made significant advances. An important example, according to Dr B.M. Craig, Director of the Prairie Research Laboratory, is the present ability to sanitize cassava and other plant material *in vitro* and to reproduce this material in a form that can be distributed to farmers for propagation. The network of banana projects supported by IDRC could also benefit greatly from the application of this technology.

Other immediately useful applications of this technology include the rapid asexual propagation of valuable hybrid materials, and the identification, selection, and multiplication *in vitro* of naturally occurring mutants with enhanced resistance. But, cautions Dr Craig, we must not overlook other areas that can have as many benefits such as the development of hybrids and disease control.

Remarkable progress has also been made in Canada in developing practical, integrated pest management systems (IPM). These systems combine chemical, biological, cultural, and genetic methods for effective and economical pest control. IPM is now gaining acceptance in Canada as a potentially practical approach, but because it is site specific, it cannot be transferred. The methodology can be, however. Fruitful cooperation is envisaged in the application of pest monitoring systems, in basic research on common pests, and in breeding plants for resistance.

The scientists warn, however, that the potential application of IPM in developing countries must be judged with caution. Wherever a fast increase in food production has the highest priority, direct control of pests and diseases will be necessary, although careful attention should be paid to already identified health and environmental hazards.

In this context, natural plant products could play an important part as they may offer a safe and cheap solution to production and health problems. Sound ecological principles underlie the suggested research program for developing herbicides, medicines, insecticides, and green manures from indigenous tropical plants. According to the scientists, the first step of such a program should be the identification of biological phenomena related to plant products, many of which are known to farmers and used in traditional agricultural systems.

Although Canada has a long history of

## MORE FISH TO FRY

Until recently many people thought of "food from the sea" as a solution to the world's food problems. But it has now become very apparent that food production from catch fisheries is fast approaching a finite limit, says Dr G.I. Pritchard, director of aquaculture and research development for the department of Fisheries and Oceans in Canada.

The same does not apply to aquaculture, which has great potential as a source of animal protein, particularly in the tropics where huge areas of fresh, brackish, and marine waters are still undeveloped. But Dr Pritchard warns that, while high yields are possible in tropical waters, actual yields will depend on "the state of technology, levels of scientific inputs, and the skill of the farmer, rather than the productivity of the environment and natural processes."

Dr Pritchard's report suggests that basic research priorities for aquaculture in the tropics should include improvement of fish stocks, development of previously uncultivated indigenous species, control of fish health, and studies of the ecology and dynamics of ponds and other bodies of water.

Canada has a great deal of expertise that could be relevant to aquaculture in developing countries, says Dr Pritchard. In areas related to control of fish diseases, for instance, Canada has become a world leader in the past 10 years, providing advice even to Japan, where aquaculture is an age-old art. Canadians are also recognized as leaders in the subject of marine plants, an often neglected branch of aquaculture.

forestry development, Gilles Lessard, IDRC program officer, warns that "we are starting from scratch on forestry research applicable to developing countries." This is not to say, however, that cooperative programs are not possible.

Canada could undertake a good deal of useful work and develop appropriate technologies in the field of energy from biomass. Research should be aimed at developing efficient systems of burning wood directly, or converting it into more versatile fuels — charcoal, alcohol and gas. Also promising is research on fuelwood sources such as identifying suitable species for energy plantations and the use of agricultural residues.

#### FORESTS AND FISH

Forestry in the tropics is also called

upon to solve the problems of land reclamation and rehabilitation and the maintenance of environmental quality. Some 1000 million hectares of once-forested lands have been turned into semideserts and the destruction is continuing. To find a solution, research is urgently needed on the introduction of drought-tolerant species, afforestation and management techniques, and methods of dune fixation. According to the working group on forestry priorities, much basic research work could be done in Canadian greenhouses and laboratories to assist in these efforts, particularly in the areas of tree propagation techniques, seed production and seeding methods, and the application of pest management techniques.

Canadian fisheries' capabilities could also be profitably enlisted to support aqua-

culture projects (see *More fish to fry*). Areas that would yield the greatest results both in terms of food production and institutional liaison, while closely matching developing country priorities, include research on fish reproduction, mariculture systems for molluscs and algae, processing techniques, and fish health.

All concerned institutions and research centres are being invited to help refine the priorities set down at the symposium. It is a first step to working out a plan of action for tapping the wealth of Canadian Researchers and facilities in a way that responds both to the developing countries' plea at UNCSTD (United Nations Conference on Science and Technology for Development) for scientific cooperation and to Canada's pledge for the benefit of the rural poor of the semi-arid tropics. □

## TOWARDS A BETTER GRAIN

Sorghum and millet are the most important food crops of the semi-arid tropics. They provide 90 percent of the food energy requirements of the rural people in the Sahelian region of Africa, says Dr R.D. Reichert, of the National Research Council of Canada's Prairie Research Laboratory. Yet the research work done on sorghum and millet has been small compared to that done on rice and wheat, and has been concerned more with quantity than with nutritional and cooking quality.

Canada's considerable expertise in the area of grain quality could be utilized in solving some of the problems involved with sorghum and millet, says Dr Reichert in his report. With the encouragement of IDRC, a good deal of basic research has been carried out in

Canada in the past 10 years, in spite of the fact that very little of either crop is grown in the country.

Sorghum production is on the increase in Canada, however, particularly in the hot dry regions of the southern prairies, so the research could have unexpected benefits for farmers at home.

For the future, Dr Reichert sees a great need for the development of standardized analytical methods to help researchers select from the tens of thousands of sorghum and millet varieties. "Only limited progress has been made in defining quality characteristics of sorghum or millet grains," he says. "It is safe to say that many years of work by many individuals all over the world will be required before they are established."

## SELF-FERTILIZING CROPS

About one-third of all fossil energy used in current agriculture goes into the production of chemical nitrogen fertilizer. It is the single most costly input, and its cost will continue to increase as the supply of fossil fuels dwindles.

One solution may be found by studying plants that "create" their own fertilizer. Legumes such as cowpeas — an important protein staple in the semi-arid tropics — can do just that. By combining with soil bacteria called rhizobia they are able to extract nitrogen from the air in a process known as symbiotic nitrogen fixation.

In a report on research in this field, Dr R.W. Miller, who heads Agriculture Canada's nitrogen fixation program, says that such research "should be viewed in the same light as research on non-renewable energy sources and energy self-sufficiency for less-developed countries."

Although legume breeding programs specifically to optimize symbiotic nitro-

gen fixation have only recently begun in Canada, Dr Miller is confident that much could be done in a relatively short period to improve yields of both forage and grain legumes. Similar research in the field of forest biomass production was also receiving increasing attention but, despite some important discoveries, Dr Miller felt "a great deal of investigation was still required."

For the long-term future, Dr Miller predicts that the greatest advances will be made in creating new strains of bacteria through "genetic engineering and the application of recombinant DNA technology". The transfer of symbiotic capability to new plant species will not likely be accomplished in this decade, says Dr Miller, but warns that such a sustained research effort is essential. Without it "we and our colleagues in the less-developed countries will ultimately be placed in the position of buying this technology at a much higher price."

## GOODBYE, BIRDS AND BEES

The plants of the future may well owe a good deal more to the dissecting microscope and the culture chamber than to the birds and the bees. Plant tissue culture is a new approach to plant breeding that is fast emerging from the realm of speculation into farmers' fields.

In fact, plant tissue culture systems have already succeeded in producing disease-free plants, according to a report by W.A. Keller, of Agriculture Canada's Ottawa research station. "Canadian researchers have made significant contributions to production of virus-free crop plants in cassava and various legume species," says Mr Keller.

Once a disease-free plant has been regenerated — perhaps from a shoot tip or a piece of a leaf — it can be used to produce as many as one million uniform plants in a year. Such techniques would be of special value in tropical agriculture to improve production of root crops such as potato, sweet potato, and yam. Plants generated in the laboratory with superior resistance to factors such as drought, soil salinity, or disease, could be crossed with local varieties to improve the species.

Tissue culture has many other possible applications, including preservation of valuable germplasm and synthesis of natural plant products. But perhaps the most fascinating is the possibility of being able to make very wide crosses between plants of different species, and effectively produce completely "new" plants.

Basic tissue culture facilities, says Mr Keller, do not require a great deal of sophisticated equipment. He adds: "The international agricultural research centres could play a major role in research coordination and ensuring the transfer of new techniques."



## WANTED: HEARTS, MINDS, NAMES ... AND GUTS

*Determination and optimism make change*

ERNEST COREA

In a sleepy little township off the southern coast of Sri Lanka the only movie house in miles rarely draws a capacity crowd. Perhaps the movie house is badly sited. Perhaps the potential clientele is too poor, on the average, to include celluloid entertainment as a line item in their household budgets. Who knows? But the old lady who owns the movie house remains undaunted. Her house is never half-empty. It is always half-full, she insists.

In numerous capitals across the world, a similar sense of optimism does not come so naturally. Cultivating it, however, often appears as essential as eating or drinking. How else can one come to terms with the tortuous process of change?

To governments and people in those countries that the experts have classified in their quantified, heartless jargon as LDCs, LLDCs, MSAs, or whatever — anything other than lands with real live people — optimism is frequently compulsive. The slightest shift from bad to

better has to be viewed as a vector pointing, even with some hesitation, towards good. To see it any other way would be to succumb to a kind of national moodiness that moves inexorably towards a nadir of chaos. Every event has more than one dimension. Your point of view determines the dimension you choose to emphasize. And in that emphasis lies a difference of perception between achievement, however partial, from which sustenance can be drawn for the future — or failure, from which there is no salutary escape. It is the act of choice that holds together the hopes and aspirations of those who see inequities as a passing, albeit prolonged, phase in human history.

Somewhere around two decades ago, a former British ambassador in the United States, Sir Oliver Franks, introduced the phrase "North-South relations" into the lexicon of international politics. A "worldwide cleavage along that axis might come to rival East-West relations as cen-

tral concern of world politics," he argued, in the context of a broad review of international development policies. That was remarkable prescience for somebody writing shortly after the Marshall Plan had referred in a desultory kind of way to aid for "dependent overseas territories." That was at a time when the paternalistic concern of the World Bank and the specialized agencies of the UN, (supplemented by avuncular bilateral charity) was considered more than enough of a crutch to help the children of twilight and darkness (brown and black) limp, walk, skip, and finally run towards prosperity and dignity.

That was in the 1950s when, by and large, it was assumed that half-full lives could be made full with some concessions, some assistance, but without any major alterations in the overall state of relations between countries and peoples. Frank's assessment at that time was, in a sense, revolutionary. From another point of view, however, it was almost inevitable. For, despite the relative simplicity of ideas in the 50s, that was a decade in which the fate and future of re-emergent states, bursting on the world in the first thrusts of decolonization, preoccupied men and women of goodwill.

Much has happened in the intervening period. One can write off a lot of those events as half-empty and therefore inconclusive.

Or one can see them as half-full, justifying hope and optimism among those who have no alternative but to hope for, and believe in, change.

It can be credibly argued, for instance, that despite a great deal of footdragging, some worthwhile successes have been added to the North-South conspectus. The Conference on International Economic Cooperation drew urgent attention to the need for debt relief and eventually brought about debt forgiveness of some \$US. 5 billion. UNCTAD IV (United Nations Conference on Trade and

Development) secured agreement on the establishment of a Common Fund, whose Articles of Agreement were adopted in June 1980.

UNCTAD V alerted the world to the particular and generally forgotten or ignored difficulties of smaller, resource-sparse countries. The (August-September 1980) 11th Special Session of the UN General Assembly produced a framework for development strategy in the 1980s, and a renewed pledge of enhanced resource transfers. All, obviously, has not been lost.

When the 35th annual regular session of the UN General Assembly broke last year, New York's media pundits declaimed that, in terms of the North-South relationship, the session had been a resounding failure. The South, or the world's disadvantaged countries, had signally failed, they claimed, to secure the large sums of money they had hoped to wrest from the North. Ergo, they were leaving the "glass house" as empty as always. Not quite. The regular session endorsed an International Development Strategy with specific goals and objectives for the 1980s, "a document" according to Canada's Secretary of State for External Affairs, Mark MacGuigan, "which can serve as a benchmark for the efforts of the global community over the coming decade." The regular session failed, however, as did the 11th Special Session, to secure agreement on a framework and procedures for a global round of negotiations aimed at refashioning economic relations between South and North.

The failure of the 11th Special Session to reach agreement and the transfer of deadlock to the 35th regular session of the UN General Assembly did not, however, end the momentum of a search for accommodation and change. Early in January 1981, Assembly delegates returned to the joust. Hanging over them was the presentiment that movement was unlikely until the change of guard had been completed at

Washington. Nevertheless, the Assembly decided to keep the issue open. The unstated assumption of that decision is that movement is still possible.

Patience and optimism have once again been established as virtues worth cultivating. But patience is not pervasive. In parts of the South, impatience has grown to the point at which there are very serious thoughts about "delinking" — withdrawing from a skewed global system and concentrating purely on South-South relationships. "We have nothing to lose from the process except the indignities forced on us," an African finance minister once said. "Delinking" will create quite severe hardship at the outset, it is argued, but that will be more than compensated for by the preservation of dignity and self-respect.

The growth and articulation of those feelings can only exacerbate international tensions. For, in truth, such feelings are rarely based on cold and rational calculations. Rather, they are manifestations of deeply felt inward emotions, arising from a distaste for the prospect of being continuously disadvantaged. Those who argue for accommodation, for concessions and compromise, however abrasively they might do so, continue to take the optimistic view that change can be wrought by negotiation and should not be wrested by turbulence. They see every slight shift of emphasis among their counterparts in the North as a possible opening towards progress, and it is in that spirit that many of them reacted to a remarkable "media event" last year.

In the spring of 1980, many of the world's leading media houses rediscovered the world's poor. The "wretched of the earth," to borrow Frantz Fanon's evocative phrase, occupied prime time on radio and television, as well as valuable column space in daily newspapers and news weeklies. The quality of coverage was as astonishing as the quantity. Past

norms were suspended. The world's poor were not paraded across air waves and column space as bulbous-eyed, hollow-cheeked, potbellied, and half-clad. To the contrary. They appeared, instead, as part of an equation that if properly worked out across the world, could yield the coefficient of international stability.

The "media spring" of 1980 was a reaction to a report written under the direction of an illustrious and dynamic West European — *North-South: a program for survival*, the Report of the Independent Commission on International Development Issues under the Chairmanship of Willy Brandt.

A technocrat who was associated with the Brandt Commission has said that "the real starting point (of change in North-South relations) is to cross a philosophical bridge that recognizes the need for change, and the trouble is that too many people participating within the international discussion have not yet crossed that philosophical bridge". Yes, surely, that bridge must be crossed, but not only by participants in international discussion. It must be crossed by a host of others without whose understanding and acceptance the changes that can make our global village more livable will not be attempted. The most crucial lesson to be drawn from reaction to the Brandt report is that change will not come unless North statesmen who understand and who care give their hearts, minds, names, and guts to it.

The South is already committed to change. They have no alternative. Leader after leader at the Sixth Conference of Heads of State of Government of Non-Aligned Countries (more easily recognized as the Non-Aligned Summit) held at Havana in September 1979 made or implied the point. "Some of us are better off than others, but, among the disadvantaged, comparisons are sometimes little more than a relative measure of hardship . . . What is more important,

then? Should we engage in fervent discussions over political schisms and semantic nuances, or should we summon the political will to combat human suffering?" said J.R. Jayewardene of Sri Lanka.

The world is often told that the North-South relationship remains interminably at the level of dialogue, with inadequate progress into the realms of action that lie beyond dialogue, because too many countries of the South have combined to form a redoubt behind inflexible negotiating positions; and because their most-used weapon is "rhetoric". The seeming stridence by representatives of the South at international meetings reflects their commitment to a deeply felt cause. It also reveals the assumption that militancy as a tactic in international negotiation is the only substitute available for the forms of domestic militancy that pushed forward the process of political liberation in earlier years. Unfortunately, it is also true that some South representatives conceal their lack of preparedness and some of their negotiating incapacities behind a cloud of verbal fog. Still, it can be argued, with demonstrable justification, that dialogue remains dialogue because the North strategy is "to talk them (i.e., the South) to death."

Equally prevalent is the complaint or charge that too much is said at the broad level of global policy and too little on the nuts-and-bolts of action-oriented sectoral specifics (energy, food, trade, etc.) This is a difficult charge to sustain at a time when the world's bookshelves are groaning under the weight of research studies that delve deeply into specifics ranging from monetary stability through food security to trade imbalance.

Excuses for the slow pace of negotiation can be found; but excuses don't resolve issues. There is no getting away from the reality that, until this relationship is rearranged, the world will continue to be burdened by a sense of global crisis. It is

because this reality has been recognized that a new round of negotiations has been scheduled for later this year. The seven industrialized countries that attended the Venice Summit of June 1980 pledged themselves to cooperation with developing countries, and agreed that "aid policies and procedures and other contributions to developing countries" should be a focus of attention at their next summit, which will be held in Ottawa, Canada, July 1981. The Brandt report proposed that a mini-summit should be held for major and binding decisions on international economic cooperation. This is likely to take place in Mexico, this summer. North-South arrangements will certainly appear high on the agenda of Commonwealth leaders when they meet in Melbourne, in the fall. The Brandt report's moving argument for "survival in mutual-ity" will form part of the backdrop to those meetings. So will the invitation by the heads of state and government of non-aligned countries to their privileged counterparts who have been urged "to exercise the political will and courage and take steps to seek a solution to the problem of recession in their economies, based on the generation and growth of aggregate demand and productive capacity in the developing countries."

Words, figures, proposals, compromises, solutions . . . these have been heard in the past, and will be heard again in the future. They will have real meaning only when the journey towards that "philosophical bridge" is truly on its way. □

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*Commentary provides a forum for readers to explore topics raised by Reports, or to present alternative perspectives, informed opinion, and analyses of development issues. The views published are not necessarily those of the editors or IDRC.*



**H**elp wanted: engineers, technologists, managers, professional and systems persons, particularly in energy and related fields, machine occupations, construction trades, manufacturing, and primary industries. Opportunities also exist for entrepreneurs. Persons under 50 years of age preferred.

That, in a capsule, is what the Canadian department of employment and immigration forecasts will be the labour demands of the 1980s — demands that Canada will not be able to meet domestically. The shortfall will be met through immigration, and as many as two-thirds of the migrants will be from developing countries.

Between 1961 and 1972, UNCTAD (United

Nations Conference on Trade and Development) estimates that developing countries gave the USA, Canada, and the UK close to \$US. 44 billion. It came in the form of some 231 000 skilled migrants added to their labour pools. Total official development assistance from the three industrialized countries amounted to \$46 billion during the same period.

International migration has continued to accelerate since the early 1970s. Some, like the Indochinese — 60 000 of them in Canada alone since 1978 — are refugees. However, most leave their homes permanently or temporarily in search of work and better living conditions. They are, in a sense, economic refugees.

Because of the volume involved — estimates range from 12 to 20 million workers abroad — the migration of workers has become a central feature of global economic realities during the past two decades. Some countries are now exporting up to a third of their labour force. In some receiving countries, more than half the work force is made up of migrants.

At the base of work-motivated migration is an income gap between receiving and sending countries. And while movements do take place between developing countries themselves (see *Reports* Vol. 8, no. 1), the most voluminous movements are without a doubt from the developing to the industrialized world.

According to Sergio Diaz-Briquets, program director with the Population Reference Bureau in Washington and formerly with IDRC, the causes of international migration are the same as those prompting migration from the rural to urban areas of the Third World — lack of land, wage and employment gaps, and population pressures — made all the more obvious by easy travel and communication. It is a case of "modernization without development", he says.

#### GAINS AND LOSSES

There can be little doubt that individual migrants benefit materially from their move. Emigration has also been viewed as a blessing for the exporting country, as it can serve to lessen the unemployment problem while bringing in foreign exchange in the form of remittances sent home by migrant workers.

A key factor in weighing costs and benefits is whether the emigrants are easily replaceable or not. Evidence now shows that most migrants are among the better educated, higher skilled, and more enterprising members of society and were actively involved in the labour force prior to their departure. In a number of countries, migration has had the effect of intensifying shortages of skilled manual labour.

The loss of skills to the country of emigration can be compensated to some



Photo: Employment and Immigration Canada

## EXODUS OF SKILLS

MICHELLE HIBLER

*The export of labour is bleeding developing countries of their most vital assets*



extent by the training and experience acquired abroad. This is true, of course, only if the migrants return home, where they continue to practice the same occupation, and if those skills are needed by the home country — not always the case.

The money sent home by migrant workers — remittances — is a much more tangible benefit. In 1975, remittances to developing countries reached some \$8 billion. The funds are essential to some families' survival: Mexicans working in the USA, for example, each support an average of 5.4 dependents by repatriating 30 percent of their earnings. Remittances have also become a crucial part of national budgets and, according to the Worldwatch Institute<sup>†</sup>, grew much faster in the 1970s than any other element of the GNP of labour-exporting countries. Turkey and Portugal earned more from remittances in the early 70s than from their exports.

Dependency on remittances can leave labour-exporting countries in an extremely vulnerable position. As the demand for their workers drops, they face higher domestic unemployment combined with a diminishing source of foreign exchange. In Western Europe, 25 percent of migrant workers left as a result of the 1973–74 recession. Some 80 000 workers returned to Turkey where, by 1977, remittances had dropped to 40 percent of their previous level, and by 1978 to 15 percent.

#### WHO WINS?

There can be little doubt about who profits most from labour migration, apart from individual migrants: the receiving countries. The ability to import temporary workers means that a country has, in effect, a reserve supply of labour. This contributes to increasing the flexibility of the economy to respond to shifts in demand, and also itself generates a demand for goods and services. A 1974 Canada Employment and Immigration study on the economic impact of immigration concludes: "The most likely major effects of immigration appear to be two: a larger, more flexible and adaptable labour force, and increased economic growth and higher per capita incomes."

The immigration of skilled workers saves the host country the cost of educating its own workers. The best documented example is the brain drain, or what UNCTAD calls the "reverse transfer of technology". A recent World Health Organization (WHO) multinational study of nurse and physician migration\* shows, for instance, that in the early 1970s, 140 000 physicians were working outside their home countries. In Canada, more than 30 percent of all physicians are foreign medical graduates. WHO estimates the amount spent on training migrant Filipino doctors at \$100 million, or twice the annual health budget of the Philippines. The loss to India is estimated at \$144 million.

Other benefits accrue in times of economic recession as migrant workers on temporary visas and work permits can be repatriated. In Western Europe, temporary migration has long been the rule. In the mid-1970s, some 1.2 million workers returned home and new entries

were sharply reduced. This ability to export unemployment to less developed countries helped many European nations offset the effects of recession by keeping domestic unemployment at lower levels. Seasonal migration is also increasing in Canada and the USA, mainly to serve agriculture.

If immigration is advantageous to the host country, it is not without costs, mainly social costs. Some argue that the influx of skilled workers discriminates against host country citizens as inadequacies in training facilities are perpetuated. A reduction of "imports" would mean that more local workers would need to be trained, opening up avenues to people who otherwise are deprived of opportunity. These people are traditionally low income groups, minorities, and women.

The presence of less-skilled migrants at the low end of the wage scale can also prevent wages from rising as rapidly as they otherwise would, thus causing hardships for nationals who can't leave such jobs. Social tensions can be aggravated, particularly at times of slow economic growth, as competition for jobs, housing, and services is heightened.

#### A SHARED RESPONSIBILITY

According to WHO and other agency demographers, both receiving and sending countries must share the responsibility for the volume of migration. In the case of developing country nurses and physicians, WHO says that developing countries graduate far more physicians than they can afford to employ. The industrialized countries, for their part, train insufficient numbers, mainly "as a result of restrictive practices of the medical profession."

Moreover, says the study, as medical curricula in developing countries are based largely on standards of the Western world, medical schools confer a degree that is "tantamount to an international passport."

The same misdirection of training and skills formation, and the resulting inability to absorb those skills, is seen as responsible for the migration of a host of other professionals. The Third Malaysia Plan, for example, projects that the supply of "non-technical" graduates from colleges and universities will exceed demand by 41 percent this year, while a shortfall of 43 percent is expected in the supply of business and accountancy diploma holders.

In the case of the brain-drain — in reality a money drain — the primary responsibility will have to be borne by the developing countries. The WHO study recommends a number of measures that can be taken to help manage the flows. They include better planning, matching of education and training programs to national priorities, developing management capabilities, and creating networks of institutions to facilitate technical cooperation. Developed countries can assist by minimizing their preferential bias for professional and highly skilled workers in their immigration laws, and by increasing their training facilities to meet needs domestically.

Any solution to the problem is necessarily long-term, and must address the deeper problem of which migration is only a symptom. If the economic necessity that forces migrants to seek their fortunes elsewhere could be satisfied at home, the flood of migrants might abate to a manageable flow. What is needed is labour-intensive development in developing countries, a restructuring of labour markets, and better income distribution both within and among countries ... in short, development. □

<sup>†</sup>International migration: the search for work, Kathleen Newland. Worldwatch Institute, 1776 Massachusetts Ave. N.W., Washington, DC 20036, USA.

\*Physician and nurse migration: analysis and policy implications, WHO, 1211 Geneva 27, Switzerland.

## RETURNING HOME

It costs an estimated \$60 000 to \$70 000 to educate a Third World social scientist abroad to the doctoral level. But, too often, the research skills are not put to work on the graduate's return due to lack of local research funds or because of the young researcher's difficulty in making contacts with overseas funding organizations. The lack of research infrastructure and opportunities has been identified as one of the causes motivating professionals to migrate.

Sometimes the returnee is confronted with a number of conflicting demands — consultancies, university teaching and administration, community work. As even small research funds are increasingly hard to obtain from local sources, basic research becomes a second or third priority and the research training investment is some-

times not followed by any application.

To help young researchers make the transition from training to independent work, IDRC launched a program in 1979 through which African social scientists trained in Canadian institutions can obtain small grants for their first piece of research on their return home.

Some 15 grants of \$4000 to \$8000 have been given so far, in support of research that concerns both the researchers and their governments. The Canadian academic community is also involved in helping to identify the researchers.

Through projects such as this, trained professionals are being provided with an opportunity to use their skills for the benefit of the country that made the investment. In a small way, it can help developing countries keep much needed skills at home.

# ALWAYS THIRD?

Development from  
three different  
perspectives

**"T**he Third World: must it always be third?" was the question asked of five leading experts in development issues. Their answers formed IDRC's 10th anniversary lecture series, held in Ottawa during November and December of 1980.

The following excerpts present regional views from Africa, Asia, and Latin America. The full text of these lectures, as well as those by Shridath Ramphal, Commonwealth Secretary-General, and Paul-Marc Henry, former president of the Development Centre, Organization for Economic Cooperation and Development, are published in the March/April issue of *International Perspectives*, Suite 302, 150 Wellington St., Ottawa, Canada K1P 5A8.

## AFRICA

### PERMANENT UNDERDOG?

**N**ot only are the forecasts for the immediate future very gloomy, but the prospects for development and economic growth in Africa up to the end of the millenium are heartrending. Indeed, if these projections are to be believed, the 1960s and 1970s may, by the end of the century, appear in retrospect to have been a golden age.

Our own ECA (Economic Commission for Africa) projections indicate plainly that unless the orientation of the African economy changes, there is a danger that poverty and the attendant problems of political and social instability will become considerably worse in Africa in the next two decades.

The extreme vulnerability of the African economies, the deepening economic crisis or series of crises, and the disenchantment with the international economic system, including the growing belief that it is colonial and exploitative in its effects on the African economies, are all factors which are making an increasing number of people wonder whether the struggle for economic emancipation would not need to adopt and adapt some of the strategies and tactics of the nationalist movements. Consequently, there is increasingly widespread acceptance by African leaders that the continent has no choice but to adopt a development strategy based on achieving an increasing measure of self-reliant and self-sustaining development, based on the internalization of the factors of development, distribution, and consumption. There is a growing awareness of the fact that this kind of development can only take place if the following conditions are satisfied: the democratization of the development process; the initiation of a process of de-alienation; the creation of the right political and social environment; the recovery of self-confidence by the peoples of Africa in themselves; and the willingness to achieve effective and meaningful intra-African cooperation.

Africa today presents a remarkable paradox: on the one hand, an increasing population of mostly young, energetic people, eager to learn and to work, but without jobs, sinking gradually into poverty and despair, and, on the other hand, a staggering regional endowment of resources. The missing factors are not simply the know-how, the self-confidence, and the will to cooperate, but the lack of purposeful, single-minded, development-oriented leadership that is determined to engineer the socioeconomic transformation of the country with a minimum of delay.

As far as African countries are concerned, they have to go back to first principles of development and economic growth — knowledge of natural resources that underlie all development efforts; knowledge of population and its dynamics as the basis of factors of production, distribution and consumption; development of technologies appropriate to the use of these resources; establishment and management of relevant institutions for organizing production and distribution, and provision of the necessary factors of production and distribution; and acceptance of the relevance of political and social stability.

These ideas form the base of the Strategy for the Development of Africa in the United Nations Third Development Decade. With African countries pulling up their socks, determined to make the sacrifices needed for the achievement of these objectives, and with their leaders providing the political will, without which they cannot be achieved, the necessary external assistance should not be late in coming. With the objectives achieved, Africa should not remain forever the underdog of the world. And since African problems constitute the heart of the problems of the Third World, the Third World will not always remain at the periphery of the international economic system. It is our hope that the whole world will rise to this challenge.

Adebayo Adedeji  
Executive Secretary,  
Economic Commission for Africa



# ASIA

## NOT THIRD-RATE

When the phrase "Third World" was introduced to international politics by a French political scientist in the mid-1950s, it was used to describe those nations that refused to be drawn into the policy of international confrontation pursued by mutually hostile blocs. There was a certain dignity to the phrase then: a "third way" was possible in world affairs, the phrase implied. Unfortunately, the phrase has gone down in common use as a symbol, in global shorthand, to encapsulate conditions of backwardness as opposed to the comfort and overall superiority of the First World. I reject the widely prevalent connotation of "third-rate" or "third class".

Excavations have shown that India's Indus Valley civilization was highly developed. The Maurya empire developed a sophisticated system of administration, nurtured irrigation and agriculture, engaged in regional diplomacy, and was characterized by sparkling intellectual activity. Also, in Sri Lanka, the existence of a flourishing agriculture based on a network of irrigation systems that covered some 600 miles bears witness to knowledge of, and familiarity with, many sciences. All this was part of Asia's patrimony. There was nothing third class or third-rate about that patrimony.

Economic history helps to explain how the inequities of the past interact with those of the present to keep poor countries poor, despite their best efforts. The age of political liberation has not brought us economic liberation because the levers of international economic power continue to be manipulated in distant capitals. Our quest for economic liberation is thus no less than a logical and inevitable continuation of our struggle for political freedom.

Political freedom did not close the power gap between North and South countries. What political freedom gave us was parity in decision-making with those big powers and superpowers. We are able to exercise our sovereign rights to the best of our judgment, in keeping with our perception of our best interests. We do not expect economic liberation to close the gap between rich and poor nations overnight.

The quest for international partnership will make little or no difference to the lives of people most affected by disadvantages and disparities, if it is not accompanied by a parallel dynamic domestically. It is the responsibility of developing countries to construct domestic structures designed to take maximum advantage of international arrangements, and to share the product of domestic and international gains equitably.

Global initiatives, sectoral initiatives, national initiatives... none of these comes cheap. Development requires both a national and international effort, whether by way of nurturing equity or mobilizing resources. Economic self-interest demands that the North cooperate with the South in building new economic and financial arrangements to replace those post-World War II arrangements which are now dysfunctional.

Similarly, political self-interest requires that the North responds to the South's demand for economic liberation no less than it did to the struggle for political freedom. Anarchy, as a response to continued economic deprivation, will affect us all.

The South will not wait indefinitely for responses, whether at the global or sectoral level, from the North. There is a growing feeling of impatience among many developing countries, leading to renewed thoughts of "delinking" — getting out of the global system, and concentrating purely on South-South relationships. Do not underestimate that feeling, which bites deeply into the economic and political self-interest of the North.

The Hon. Gamini Dissanayake  
Minister for Land Development  
(Mahaveli) Sri Lanka

# LATIN AMERICA

## ACTING TOGETHER

I think that when we look at the perspective of recent years, in the first place there are new opportunities for the South in its relation with the North and we must exploit them. And, at the same time, I think that everybody is coming to the conclusion that the traditional pattern of negotiation must go more and more toward some sort of ground where mutuality of interests prevails.

In order to achieve this, we must avoid some basic temptations. In the case of the developed countries, there are two temptations which I think are creating limitations to our capacity of negotiation. One is to consider that it would perhaps be good business, in the long run, to break the unity of the South. This idea of differentiation — to divide the South and to try to bring the newly industrialized countries (NICs) into the North as new partners — is wrong politically because the NICs are not developed countries. We are still underdeveloped. If the North wants to have solid political negotiations, it must consider the South as a unity.

The second temptation is also dangerous. It is the attitude of "first, let us settle our own problems, and then let us look to the South". One thing appears clear to us: it is that the South can play an active role in settling the major economic problems of the North.

Now there are other temptations in the South. One is solitude. From time to time, some countries might believe that acting alone is good. The other temptation for the South is to delink some countries. This would be completely unrealistic.

If we escape from those temptations, both in the North and the South, then I think that the idea of building a new international economic order is a valid one. It should be based on three major pillars: a realistic exploitation of the idea of mutual benefit; a realistic approach to the problems of the less developed countries; and the real development of South-South cooperation.

In this context, Latin America appears to be one of those cases of intermediary type of development. If you look at our situation of the past 20-25 years, we have shown a vigorous capacity to mobilize our productive forces. Latin America's production today is five times what it was in 1950. Of course, there is also a dichotomy in Latin America because one-third of our population still lives in conditions of extreme poverty.

When we look at the possibilities of a pragmatic mix of the major engines of growth — internal market, regional cooperation, international cooperation, expansion of our relations with the external market — Latin America could become an active partner in the world, but not by neglecting our capacity to produce and to cooperate among ourselves. It is very different to think of a Latin America linked to the world alone than a Latin America deeply strengthening its internal capacities to cooperate, and then becoming solidly united to move in the world as a force. That is the way we see Latin America in the future.

I believe that, together with a national effort to rethink our priorities, we must continue doing our best to move into a new international economic order in which equal partners are better than a division between first, second, and third worlds. The question is to make them all capable of participating in a joint effort to move ahead, under a new international economic order, in which moral incentives go hand in hand with mutual interest.

It is not a question of asking only for moral ideals as a basis for moving ahead, it is a question of identifying the capacity for moving together and, therefore, achieving things that will be useful for us and for all the countries participating in this fascinating adventure of constructing a new world.

Enrique Iglesias  
Executive Secretary  
Economic Commission for Latin America

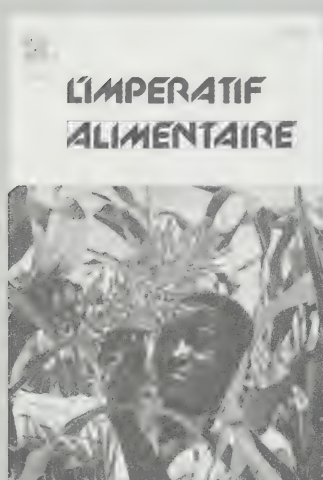
# NEW RELEASES

**L'impératif alimentaire,**  
A.D.R. Ker. Published in April  
1981, IDRC-143f.

A description of IDRC's crop science program, which supports research to increase the production and improve the quality of indigenous food crops of developing countries. More than 100 projects are described, and the names and addresses of project leaders are listed for further inquiry. French edition of original English text IDRC-143e.

**L'homme et l'arbre en Afrique tropicale: trois essais sur le rôle des arbres dans l'environnement africain,** Gunnar Poulsen. Published in February 1981, IDRC-101f.

The translation into French of a previously published work on the role of trees in tropical Africa, (IDRC-101e) the three essays in this publication address the importance of trees in the African environment, both physical and human; woodfuel supply questions; and the function of trees in shifting cultivation systems.



**Systèmes alimentaires,**  
R.S. Forrest, W. Edwardson,  
S. Vogel, and G. Yaciuk.  
Published in April 1981, IDRC-146f.

This publication describes IDRC's postproduction systems program, which supports research at all stages of the food system, from harvesting to consumption. An overview of the program is provided, as well as detailed descriptions of 51 projects and a bibliography. French edition of original English text IDRC-146e.

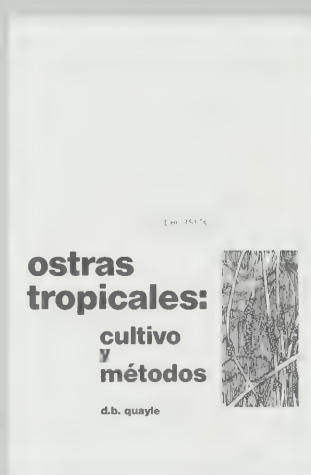
**Consulting and engineering design organizations in developing countries,** Alberto Araoz, editor. Published in April 1981, IDRC-161e.

"Consulting and engineering" are terms applied to the intellectual and professional activities involved in the introduction of new technologies and management of complex investments in development programs. This book examines the need for consulting and engineering activities in developing countries, introduces guidelines for research, and presents four case studies (Korea, Philippines, Brazil, and Argentina).

**Policies for science and technology policy research in Africa: report of a seminar held at the University of Ife, Ile-Ife, Nigeria, 3-5 December 1979.** Published in March 1981, IDRC-162e (Also available in French, IDRC-162f).

Representatives from nine African countries met to discuss priorities, establish a framework for collaboration, and outline programs for re-

search on science and technology policies in the region. This report gives an account of workshop activities. Sections on personnel requirements and training, project proposals, and follow-up activities, as well as a list of participants, are included.



**Searching: a review of IDRC activities 1980.**

Published in March 1981, IDRC-164e.

A non-technical review of the work of IDRC during 1980, this publication places research for development in perspective for a general reader. Highlighted are multiple cropping, aquaculture, and food systems; international cooperation in information sciences; human migrations and delivery of mass education; water supply and sanitation, and the fight against tropical disease. (Also available in French and Spanish editions.)

**Ostras tropicales: cultivo y métodos,** D.B. Quayle. Published in April 1981, IDRC-TS17s.

This manual, a translation

of the English original (IDRC-TS17e), describes the basics of oyster culture: biology and breeding, feeding, raising techniques, harvesting, and equipment needs. It is intended for use by both researchers and field personnel.

**Reseña de la investigación sobre efectividad de los maestros en Africa, America Latina, Filipinas, India, Malasia, Medio Oriente y Tailandia: síntesis de resultados,** Beatrice Avalos and Wadi Haddad. Published in February 1981, 118 pages, IDRC-TS23s.

The Spanish edition of a review of teacher effectiveness research (IDRC-TS23e), this publication identifies advances and gaps in the knowledge as defined by researchers from seven geographic areas, and pinpoints the policy issues in each area.

**Educational innovation in the Philippines: a case study of Project IMPACT,** Pedro V. Flores. Published in April 1981, IDRC-TS36e.

IMPACT (Instructional Management by Parents, Community, and Teachers) is an innovative system for the delivery of low-cost mass primary education in developing countries. This book presents a history and analysis of IMPACT in the Philippines. It is intended for planners and practitioners involved in further replication of the IMPACT approach in their own countries, and for those interested in the process of educational innovation.





**Sanitation in developing countries: proceedings of a workshop on training held in Lobatse, Botswana, 14-20 August 1980.** Published in April 1981, IDRC-168e.

Representatives of eight African countries met to plan personnel development for sanitation and encourage upgrading of professional, technical, and village level training programs. This publication contains all presented papers, discussion summaries, and resolutions and action plans from the workshop.

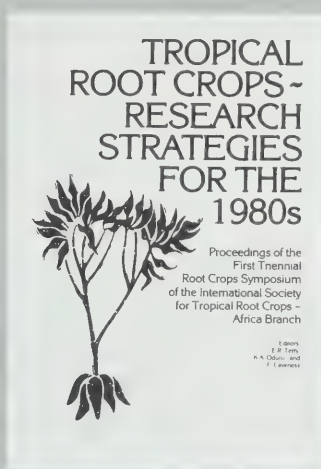
**Rural water supply in developing countries: proceedings of a workshop on training held in Zomba, Malawi, 5-12 August 1980.** Published in April 1981, IDRC-167e.

The workshop was a forum in which technologists and trainers considered low-cost, renewable energy technologies for water supply. The training aspects of operation and maintenance, community participation, and health education in its delivery were

also discussed. All presented papers, discussion summaries, and resolutions and action plans for training are included in this publication.

**Determinantes del rendimiento escolar: reseña de la investigación para los países en desarrollo,** Ernesto Schiefelbein and John Simmons. Published in February 1981, 36 pages, IDRC-TS24s.

The publication is the Spanish edition of a review of the determinants of school achievement (IDRC-TS24e). It presents the results of 26 studies on the major determinants of cognitive achievement, as well as conclusions on the implications for policy and research.



**Tropical root crops: research strategies for the 1980s: proceedings of the first Triennial root crops symposium of the International Society for Tropical Root Crops — Africa Branch, 8-12 September 1980, Ibadan, Nigeria,** E.R. Terry,

K.A. Odoro, and F. Caveness, editors. Published in March 1981, 280 pages, IDRC-163e.

This publication gathers papers presented during a symposium on the four major root crops of the humid tropics — cassava, yams, sweet potatoes, and coco-yams. A discussion summary of the proposed strategies, a list of participants, and a bibliography are included.

**Educación, trabajo y empleo: reseña sumaria,** Maureen Woodhall. Published in February 1981, 40 pages, IDRC-TS30s.

Seven summary reviews and an overview examine the research undertaken into the relationship between education and employment in developing countries in this Spanish edition of a report on education, work, and employment (IDRC-TS30e).

**Science and Technology for development. STPI Module 6: policy instruments for the regulation of technology imports.** Published in January 1981, 75 pages, IDRC-TS33e.

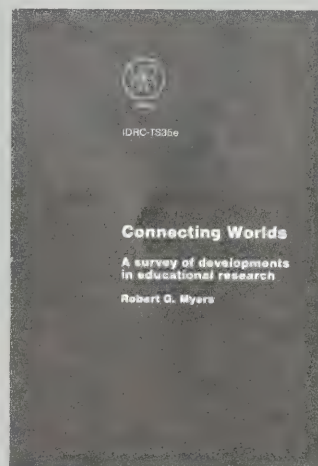
**STPI Module 10: technical changes in industrial branches,** F. Sercovich. Published in January 1981, 47 pages, IDRC-TS31e.

**STPI Module 11: technical behaviour of industrial enterprises,** F. Sercovich. Published in January 1981, 59 pages, IDRC-TS32e.

**STPI Module 12: case studies on technical change,** F. Sercovich. Published in January 1981, 35 pages, IDRC-TS34e.

These are the final publications in a series of 12

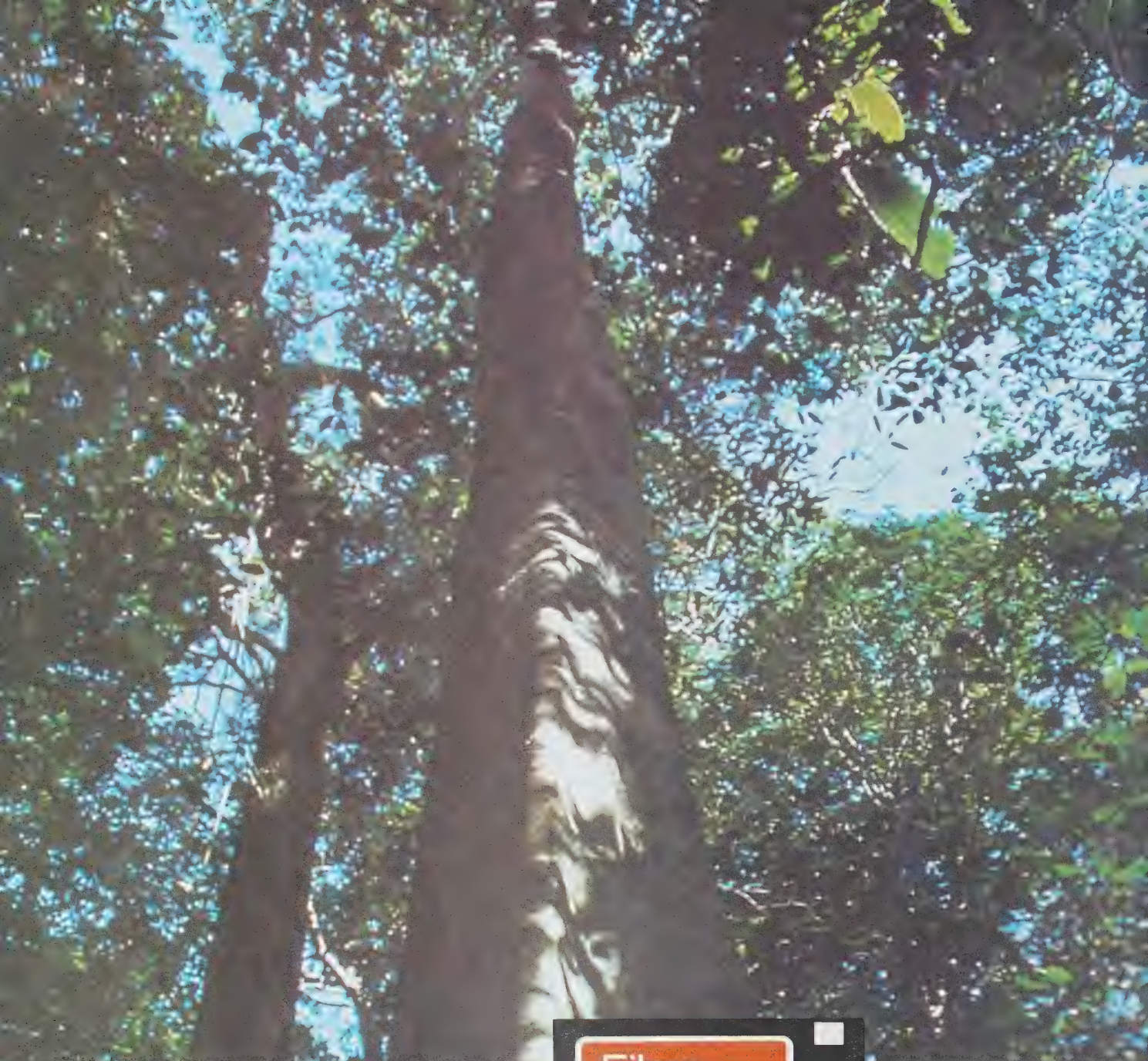
modules containing the supporting material for the findings and assertions made in the Main Comparative Report of the Science and Technology Policy Instruments (STPI) Project (IDRC-109e), a large research effort that examined the design and implementation of science and technology policies in 10 developing countries.



**Connecting worlds: a survey of development in educational research in Latin America,** Robert G. Myers. Published in January 1981, 88 pages, IDRC-TS35e.

Myers looks at three sets of connections "commonly assumed to be weak" in educational research: between researchers in the First and Third World; among researchers within the Third World; and between researchers in education and other fields. The focus is on Latin America, although the author presents observations and suggestions for improving communication across worlds of research in other developing countries.





### Choices



*An end to pounding*

## Films from IDRC

IDRC films cover a wide range of development-related topics, reflecting the Centre's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Some are primarily instructional films, others deal more broadly with topics such as rural health care or science and technology. All provide unique insights into the practical application of research to solve the problems of the Third World.

16 mm colour, available for loan or purchase. For a copy of the current IDRC film catalogue write:

### Oyster farming



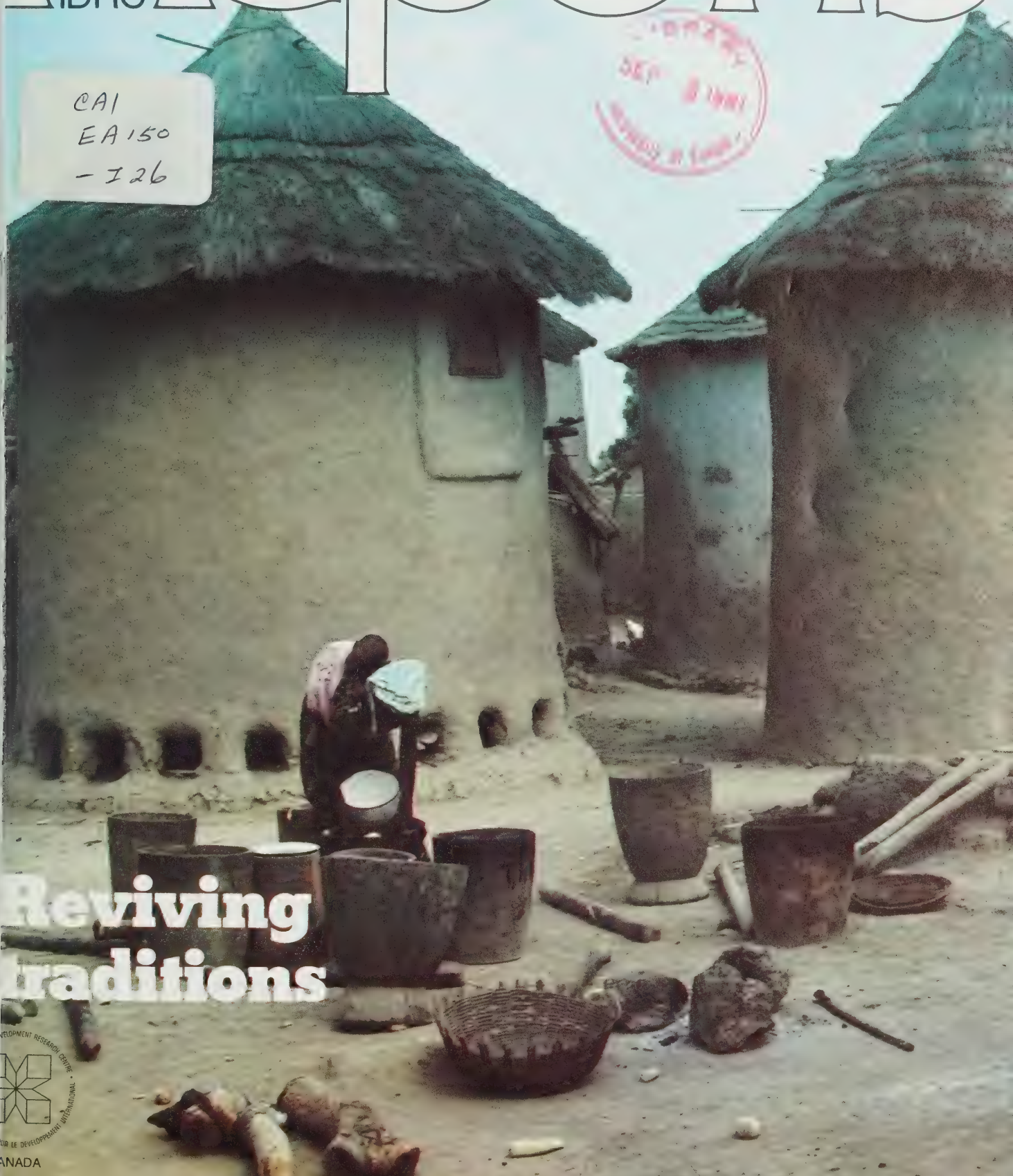
Communications  
Division  
IDRC, Box 8500  
Ottawa, Canada  
K1G 3H9



# Reports

THE  
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## Reviving traditions



# LETTERS

## Freire and the rural world

I agree with Prof. M. Zachariah's letter (*Reports*, January 1981) that more of Paulo Freire should be published since he is foremost in pointing out that education should be a liberating force for everyone. It allows individuals to develop their "humanity" in totality, thereby enabling them to confront reality and act upon it.

However, Prof. Zachariah and aid agencies should also be aware that if the masses of rural inhabitants have been exploited and oppressed, then, on reaching a critical stage of consciousness, they would rise to liberate themselves ... and their oppressors.

Third World leaders would not permit the reading or teaching of Freire because they are not interested in changing the status quo. Consequently, the masses themselves have been schooled to believe that it is through formal education that they can improve their general circumstances.

In addition to using schools to keep the rich and poor in their places, Third World leaders use them as important allocators of socioeconomic roles. Finally, as A.R. Thompson and others argue, such leaders would not use Freire's approach since a change in the established pattern of education away from international norms

would be regarded as inferior. Hence, to be accepted as being civilized, they believe that all should be schooled in the standard set by the "successful" countries.

The social and economic system in developing countries must be drastically altered before Freire's educational approach could have any qualitative effect. These countries' leaders would not allow the education system to prepare people to lead in bringing about social and economic change.

Sridatt Lakhan  
Norman Patterson School  
of International Affairs  
Ottawa, Canada

## A fly of another colour ... Erratum

May I draw your attention to an error made in my article "Dangerous developments" (*Reports*, January 1981). Line 10 of the last paragraph on page 5 reads: "... become suitable habitats for blackflies ...". The original text of my manuscript for that passage reads: "... become suitable habitats for *Glossina* ...".

The word "blackflies" usually refers to *Simulium* flies, the carriers of onchocerciasis. The common name for *Glossina* is tsetse fly.

Frank L. Lambrecht  
College of Medicine,  
University of Arizona  
Tucson, Arizona, USA

## IDRC bucking the odds

As Volckerism continues to put the screws to the world credit market and the North-South dialogue fails to make much headway, your Centre's philosophy — as spelt out in your special report (*Reports*, October 1980) — as well as your 10 years' accomplishments, have proven beyond any doubt IDRC's sincerity, pushing against many odds toward the goal of helping LDCs to attain selfsufficiency.

What form of aid can be better than the transfer of knowledge for which IDRC was created at the Canadian taxpayers' expense?

Robert Ho Chao-Chang  
The Insurance Services  
and Agencies  
Singapore

*Editor's note: Paul Volcker was Chairman of the US Federal Reserve Board under the Carter administration: "Volckerism" or "monetarism" refers to the monetary policy of restricting world money supply.*

## Help for unstable crop yields

Your description of *Sorghum and the millets* (*Reports*, January 1981) is interesting.

As a plant breeder in the All India Coordinated Research Project on Dryland Agriculture, my interest lies in the improvement of sorghum and millets because of the

considerable land area covered by these crops for food and fodder. Pearl millet is the most important rainy season crop in Haryana, so much so that its productivity of grain and fodder controls the prosperity of rainfed regions. When a reasonable potential yield of grain is possible — say, 20 q/ha for sorghum, pearl millet, maize and ragi — samples from different places and at different times indicate a wide variation, not only in protein content, but also in quality. This lack of stability is not only problematic, but elusive. In this context, the publication (*Sorghum and the millets: their composition and nutritive value*, Academic Press Inc., London, 1980) by Hulse et al. is most useful.

Naresh Mehrotra,  
Haryana Agricultural  
University  
India

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports,  
P.O. Box 8500, Ottawa  
Canada K1G 3H9*



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *EI CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee.

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**Cover:** Grain storage bins in Mali. The subsistence skills and techniques of rural people in developing countries have been refined by time and need. Now development efforts are drawing on these traditional resources as a basis for future growth. See stories page 4 and 5.

**Back cover:** Harvesting cowpeas in Sri Lanka. Food questions are now much more far-reaching than simply increasing crop yields. See stories page 16, 17, and 20.

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# COLOURED COTTON

## RETURN OF THE NATIVE

JAMES M. VREELAND JR

*A pre-Hispanic plant, coloured cotton, might weave a new pattern of economic development for poor communities of Peru's north coast*



*The technology of producing native cotton has remained unchanged. Here, a woman scutches the fiber over clean sand*

**W**hen the Spanish Conquistadores first crossed the Peruvian coastal desert valleys in 1532, they discovered, much to their surprise, extensive fields of native cotton growing in a profusion of natural colors — white, tan, maroon, mauve, chocolate brown, and other shades. Because they had encountered nothing like it in North Africa or Europe, the early chroniclers of the Conquest reasoned that Indians must have previously dyed the fiber and set it out on bushes to dry.

During the past 150 years, many scientists and explorers have been intrigued by the singular beauty and value of Peruvian cotton, including the naturalists Darwin, von Humbolt, Raimondi, Spruce, La Condamine, and Sauer, who identified and named several species of New World cotton plants. Paleo-botanists, long fascinated by the early history of cotton, tell us that the plant was cultivated by fishermen as early as 2500 BC at Huaca Prieta, an archaeological site located in the lower Chicama Valley of Peru's north coast. Although specialists still dispute its origin and place of domestication, native cotton is grown extensively in this area today and in the *ceja de selva* region (eastern Andean moist mountain slopes). In the warm inter-Andean mountain valley, it grows up to an altitude of about 1900 metres, higher than any other cotton species.

Botanically termed *Gossypium barbadense* by taxonomists, but simply called *algodón país* ("country cotton") by traditional farmers, native Peruvian cotton is still cultivated much the way it has been for centuries. A recent survey found cotton strongholds in traditional communities in the Chira, Piura, Lam-

bayeque, Jequetepeque and, to a limited extent, in the Moche and Moquegua valleys. But its existence is now threatened even in these areas, and it has become virtually extinct in most of the intervening valleys.

The reasons for this lamentable disappearance are many and complex. Because it produces a coloured fiber and relatively low yields per hectare under some conditions, *algodón país* has been the focus of a kind of economic racism. The prejudice holds these varieties to be inferior to the foreign hybrid strains now intensively cultivated throughout coastal Peru for the industrial market. When grown in proximity to these sensitive all-white hybrids, coloured cotton may cross-pollinate with them, producing undesirable intermediate breeds and muddled colour fibers unacceptable in a highly commercial market.

During the past 50 years, Peruvian legislation has clearly favoured the introduction of hybrid strains and promoted the systematic elimination of native varieties. Since the 1930s, farmers who plant *algodón país* — a perennial — must cut down and burn all stalks, leaves, and bolls remaining in the field after each agricultural season. Failure to comply with this law renders the transgressor liable to a fine of 500

Peruvian soles per hectare (about \$US. 2). Yet "illicit" native cotton continues to be grown in isolated fields and garden plots throughout the north coast where agricultural inspectors rarely venture. Recent investigations of native cotton cultivation in the departments of Lambayeque and Piura have shown that this fiber is widely used, not only in a still vigorous artisan

textile craft, but also in the practice of traditional medicinal cures, religious rituals, and in the exercise of certain prehispanic beliefs. Household spinners and weavers, for example, produce a variety of beautiful warp-striped fabrics for both domestic and ceremonial use blending five different natural colours, much as they have been doing for three millennia.

In many traditional communities, nearly every infant's head is capped with a pad of brown cotton, placed there in the belief that only its special properties can protect the baby's head from the nocturnal hoot of the two-horned owl, whose cry is thought to be strong enough to split the infant's head open. Cotton fiber is also used as a common cure for spider bites and *mal de ojo* (the "evil eye"), among other psychosomatic conditions that seem to affect many children. It is interesting to note that researchers have only recently discovered that cotton seed contains a significant amount of natural antibiotic substances as well as protein, now utilized in bread produced commercially in the USA.

Though the multiple uses of native cotton have long been known to Peruvians, *algodón país* is not presently considered to be a "permanent cultivar" under the Ministry of Agriculture's clas-

Photos: James M. Vreeland Jr



sification system. Therefore, it cannot receive irrigation water, which is administered by the state according to an article of the water law, *Ley de Aguas*, applied to all permanent crops. Nonetheless, due to its fine and deep root system, native cotton plants can survive up to five years without receiving surface water of any kind.

In addition, native cotton offers a number of advantages over competing hybrids, which are frequently destroyed during dry years. Cotton scientists and farmers alike agree that these hardy native plants are much more resistant to the some 250 different pests and organisms that attack commercial cotton hybrids, reducing yields drastically if insecticides are not applied.

Native cotton offers other important advantages. It requires virtually no maintenance after sowing, no fertilizers, and no pesticides during its long vegetative cycle. Developing into large bushes that produce fiber all year round after the first year, native cotton can be harvested for up to six years, and will yield high-grade fiber often in excess of average yields of commercial hybrid varieties. It can be grown successfully in arid soils whose high levels of salinity and boron toxicity will support virtually no other crops. *Algodón país* is also frequently grown in a tough hedgerow to protect field crops from foraging animals.

For the industrial textile market, native cotton has several useful properties. The generally long and relatively thick fibers are ideal for soft-spun yarns used for knitted socks and undergarments. The range of natural colours is found nowhere else in the world, and represents a valuable commodity for the specialty fiber and artisan markets. Moreover, coloured cotton's rich, permanent, natural pigmentation will not appreciably fade with washing or exposure to light.

Preliminary investigations of the economic and genetic potential of this plant show that native cotton deserves a closer look by plant scientists, agricultural extension services, and national rural development agencies. Determined and coordinated efforts are needed to make native cotton into a competitive market crop, and to modify official policies that discriminate against its cultivation. Experiments are presently underway in the USA, Egypt, and Peru to introduce some of coloured cotton's genetic material into commercial hybrid varieties in order to increase productive capacity.

Under the auspices of the Peruvian Ministry of Industry, Tourism and Integration, the Instituto Indigenista Interamericano of Mexico, and the Institute of Latin American Studies of the University of Texas, experimental research will be conducted in order to assess the feasibility of extending native cotton cultivation to similar arid zones. As the cost of producing or importing synthetic fibers climbs precipitously in LDCs because of the rising price of petroleum products, the cost of hybrid

cotton cultivation, heavily reliant on petrochemical pesticides and fertilizers, also soars. Hearty *algodón país*, once the mainstay of a sophisticated textile technology in the arid Andean coastal valleys, is a plant that Peruvians may rediscover once more in the 1980s. □

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## CRAFTY MEANS OF SURVIVAL

Research conducted in traditional Peruvian communities suggests that fluctuations in rural agricultural productivity can lead to substantial increases — and in some cases, a revival — of artisan activities and consumption of traditional products.

Mórope, for example, is situated in a marginally productive tropical desert zone. It seems likely that the population never fully relied on agriculture for survival, but supplemented its income with artisan, fishing, mining, transport, and trading activities. Most families today engage in some subsistence agriculture, but water shortages — or occasional catastrophic flash floods — force them to continue to engage in secondary economic activities, including craft production. Weaving, gourd carving, pottery, carpentry, adobe brick making are common.

Regulated by the agricultural cycle, artisan activities are carried out during the dry season and when crops are maturing. Most raw materials are grown or collected in the area and are available year-round, or can be stored indefinitely. The tools needed are also made from locally available materials and, like the technology, have remained largely unchanged since late prehistoric time.

The consumption patterns of the proproducts have changed in recent years, however. Rapid price rises of commercially manufactured textile

yarns and dyes have stimulated the use of indigenous fibers. And while synthetic, industrially produced goods such as blankets were common a few years ago, the trend is now to all-cotton, traditional types. According to rural consumers, the native blankets wear longer, are better woven and colourfast, provide more warmth, and are cheaper. Similarly, gourd containers, once displaced by cheap plastic substitutes, have made a spectacular comeback.

The increase in consumption of artisan fabrics has brought about a certain specialization among the district weavers. Products are now also being made for sale rather than only for household use and community exchanges.

It has been estimated that between 200 000 and 400 000 Andean farmers, herders, and fishermen are also part-time artisans. And while rural communities are the largest consumers of their products, urban markets are expanding — an indication that traditional values and belief systems survive in the cities.

An ancient strategy to counterbalance agricultural uncertainty, perennial shortages, and uneven distribution of primary resources, artisan trades still represent vital cultural activities that provide an alternative to imported, capital-intensive technologies





Hard labour and a unique  
tree produce a highly prized vegetable butter in West Africa

## THE BUTTER TREE

JEAN-MARC FLEURY

Last year, women in the villages north of Bamako, capital of Mali, were able to sleep a little longer than usual and woke with fewer aches and pains. Not that they didn't have anything to do, far from it, but a task that had occupied them for days and nights each week no longer needed to be done.

The wet season had been rather dry, and the shea, or butter, trees (*Butryospermum parkii*) had not fruited. Usually these trees produce 25 to 55 kilograms of berries resembling large plums, from which is extracted an oil that is solid at room temperature — shea butter. This vegetable oil is the main source of fat in the diet of Mali's rural people. The rice that villagers will invite you to share owes its taste and slightly yellow colour to shea butter.

Extracting the oil from the berries is women's work and it takes five to eight hours of back-breaking work to produce each kilogram of butter. It is thus not surprising that last year's meager harvests meant that women enjoyed a — albeit relative — leisure.

South of Bamako, however, the rains had come and women were as busy as usual. In the villages lining the road linking Bamako and Bougouni, they could be seen last April crushing the almonds or mixing the paste. But the season was drawing to an early end: Baba Traore in Ouelessebougou, Mariam and Assetou Coulibaly in Dialakoroba, and the women of Segessona village had already emptied the ditches in which they store the nuts. In Segessona they worked with greater haste than usual, not only because they feared water shortages, but also because a growing scarcity meant that the butter was fetching 650 Malian Francs (\$Can. 1.50) a kilo in markets, five times the price offered in October, at the beginning of the dry season.

The traditional technique for producing shea butter involves 15 steps, from harvesting the fruits to wrapping the lumps of butter in leaves for storage. It has the enormous advantage of not requiring any equipment that cannot be made locally, except for a cast iron cauldron. Its yield is very low, however. Despite the great labour involved, extraction rates of oil barely exceed 15 percent. Moreover, some steps such as drying and smoking the almonds consume large quantities of ever-scarcer firewood. If women have continued to produce the butter, it is largely be-

cause the income generated by the sale of any butter in excess of the family's needs is theirs to keep.

For peasants in Mali, Upper Volta, Benin, and in many regions of Senegal, Ivory Coast, Gambia, and Nigeria, the butter producing cycle begins in June when the berries start to ripen and fall to the ground. Until August, women — often accompanied by children — leave the village at daybreak to gather the freshly fallen berries. As the season progresses and the harvest slackens, the gathering takes longer. Since shea butter trees are not grown in plantations, long distances must be covered to gather the fruit. The tree grows wild throughout the savanna and villagers limit their "farming" to protecting the young trees until the bark is thick enough to resist brush fires. The protection given the young trees is really long term planning since the oil-bearing trees do not fruit for the first 20 years and reach maturity only after 45. In return, however, they are incredibly long-lived and fruit well until their 200th year.

The outside envelope of the berries is eaten at harvest time. This nourishing pulp represents half the berry's weight and is sometimes the only food available in July and August when

stores have been depleted and crop harvests are still some time off.

Back in the villages the women pile their harvest in pits one metre square by one and a half metres deep. Some may have up to four pits holding about 600 kg of berries. When the pits are full, they are covered with leaves and earth. An opening left in the centre lets rain water seep through. Thus left to ferment for a few weeks, the rest of the pulp decomposes. All that is then needed is to crush the fruits underfoot to remove any remaining bits of pulp.

The removal of the pulp exposes from one to three seeds or nuts. Each hard-shelled, reddish-brown nut contains an almond that is 50 percent oil.

When the nuts are fresh, the almond sticks to the shell. To separate them, the nuts are immersed in boiling water in some villages, then sun-dried for a few days. As they dry, the almonds contract and detach themselves from the shell. Elsewhere, women roast the nuts during a night, a day, and another night, which also makes the nuts easier to break. The dried nuts can then be stored for months without deterioration.

A few days before starting to extract the oil, the women's practiced hands shell the nuts by pounding them with hammers, stones, or pestles. Winnowing is then carried out by holding baskets full of nut pieces at arm's length and slowly emptying them. If the wind is strong, the pieces of shell will be blown away. If not, the operation must be repeated many times.

The eve of the day chosen for extracting the oil, the shelled almonds undergo a second drying over a wood fire to reduce their moisture content to less than 10 percent. At this stage women can sell the almonds in bulk to commercial processors. Last April, dried almonds sold for 100 Malian francs (\$Can. 0.25) a kilogram.

The second drying lasts through the night and the next morning, until "the almonds weep", say the women. As the oil begins to sweat, a particularly exhausting day begins for the shea butter producers.

The almonds must first be crushed in a large wooden mortar. Bernard Clamagirand, a member of CEPAZE, a French nongovernmental organization working with the peasants to improve their traditional techniques, has studied the process in detail. In Deban, a village north of Bamako where he spent a number of weeks, he observed a group of 15



Above and opposite: Mixing shea butter paste — five to eight hours of back-breaking work per kilogram.







## When the almonds weep, an exhausting day begins for Mali's rural women

women taking turns, three at a time, around the mortar. The three pestles struck simultaneously, once a second — and not at random. A lot of training is needed if the strokes are to be effective, he says.

The women perspire heavily under the blazing sun, because the paste must be kept warm. Under the sun and the action of the pestle, in temperatures reaching 35° C in the shade, the temperature of the paste rises to 40° C. Heat is essential throughout the extraction process because shea butter solidifies at 34-38°. Maintaining a sufficiently high temperature to keep the oil melted indicates the women's high degree of coordination and expertise.

After some two hours of constant grinding, the paste becomes fluid. Using a gourd strainer, a woman draws off the liquid oil which is then poured into an iron pan and heated briefly over hot coals before being carried to a special hut with two facing doors. It is now 12:30.

A few women kneel on the ground, each facing a polished stone a hand wide by three or four long. The end of the stone closer to the operator is slightly raised. With a ladle she deposits a bit of paste on the raised end, and using another stone, rolls the paste to the other end. This kneading process

breaks up the oil cells and facilitates the extraction of the oil. Women living close to cities will often trust this operation to a miller.

After kneading, the fine-textured paste oozes oil. It is mixed with water to separate the oil from the remaining matter.

Bent over, back straight, legs rigid, and arms tensed, the women then rapidly mix the paste by hand. Up to two seemingly endless hours of this back-breaking work is needed before the paste "sleeps", that is, starts to cover itself with a white emulsion of fat.

Rokiatou Tall, staff member of *Famille et Développement* magazine who was born in a Malian village, stresses the importance of this step as it determines the extraction rate of the oil. If it is not continued until the maximum emulsification, the already low extraction rate will be even lower. But by the time women reach this stage, says Mrs Tall, they are already exhausted and often can't attain the maximum level of extraction, explaining the low yields.

After mixing, the paste is left to rest. The oil floats to the surface and is skimmed off. It is then poured into a container filled with lukewarm water and decanted. A white film forms on the surface: it is the shea butter — it is already 18:00 hours.

The appearance of the liquid butter breathes new life into the women, who repeat the washing operation many times. The butter is then heated in a cauldron to evaporate the remaining water and allow the heavier impurities to settle to the bottom. Very carefully the women ladle out the butter and share it among themselves. After having settled all night, the butter will have solidified into a homogeneous light yellow mass. Wrapped in leaves, the lumps of butter are resistant to oxidative rancidity and will keep for years if not exposed to air and heat.

During the last dry season, Baba Traore produced a dozen kilograms of shea butter a week from November to April. She is no longer young and her children have left and so she works alone "because of disagreements. In the bush people understand each other better and work as a team to produce the butter," she says. Bisected by the Bamako-Bougouni road, her village has lost its social cohesiveness. But Baba Traore continues to produce the butter that she sells to middlemen who take it to Bamako markets. Malian peasants produce some 20 000 tonnes of shea butter annually.

Shea butter is an important food source throughout West Africa and it is the main source of cooking fat for

## SOMETHING OLD, SOMETHING NEW

Generating technologies appropriate for rural areas is a major problem facing policy makers in many developing countries. This is largely due to the fact that scientists, often educated in industrialized countries and located in metropolitan areas, are isolated from the central problems facing rural people.

This issue led Dr Amilcar Herrera, a distinguished Argentinian scientist, to develop an approach to scientific

research intended to reorient R&D systems so that they would serve the needs of rural people. Three elements characterize his approach: cooperation between scientists and peasants at all stages of the research; analysis and upgrading of traditional solutions to problems; and the development of entirely new solutions when traditional technologies prove inappropriate.

In Ethiopia, this novel approach is being tested in two areas by the

Ethiopian Science and Technology Commission (ESTC), with IDRC support.

Working through the villages' Peasants Associations, the scientists are surveying the areas to determine the specific problems faced by the communities. They will then attempt to find solutions that combine their expertise and knowledge with that of the peasants.

Among problems already identified are the soil's declining fertility and weed control. Traditional solutions "discovered" to date include green manuring, a practice that has enabled farmers to slow down soil deterioration. Soil erosion due to deforestation has also encouraged peasants to rediscover and apply the skill of terracing, vestiges of which can still be found at ancient sites in the country.

And according to Dr Haile Lul Tebicke, Commissioner of the ESTC, the method should also earn new respect for the peasants' ideas of their needs and their solutions. Getting scientists out of the laboratory and into the fields to experiment should also ensure that they become partners rather than overseers of development efforts.



Photo: C. Smart



## *Demand for the versatile oil far outstrips the production using traditional techniques*

Mali's rural population. A Malian family of seven people will consume some 150 grams of butter a day. In addition, the high allantoin content in the shea butter renders it useful as a base for many pharmaceutical preparations to treat inflammations, rashes on children, and other skin ailments, and for cosmetics to prevent drying of the skin. In fact, a Malian oil producer, SEPOM, manufactures a commercial lotion, *Karitea*, that is popular in Europe as well as West Africa. Shea butter is also used to make soap and in the construction industry where low quality butter is smeared on the banco walls of houses to prevent them from washing away during the rainy season.

There is also a vast potential export market for the oil. Shea butter is used to formulate a cocoa butter substitute and can replace it in food products without any noticeable difference. It is also used in the making of margarine and other fatty spreads. The demands from European and Japanese food industries for this lower-priced product have never been met and Sahelian countries are increasingly interested in industrializing the production of oil.

During the 1960s, French industrialists introduced special presses for extracting the butter that yielded 35 to 40 percent of the oil. Despite their

relative simplicity, a lack of maintenance brought about the rapid deterioration of the machines. They were also much too costly for the villagers. Because of their high throughput, the machines required that large quantities of nuts be massed together for processing. This was not acceptable to the population who prefer family or village-scale shea butter production.

More recently, private firms have indicated their intent to re-launch industrial production for export. Even if at industrial scale oil extraction rates can reach 80 percent, SEPOM's Director-General, M. Korotogoma Diarra fears shortages. In fact, well-watered shea trees will produce nuts every year, but the long waiting period before the trees begin to fruit has discouraged all plans to establish plantations. The shea butter tree remains dependent on the uncertain rains of the Sahel, thus causing great fluctuations in fruit yield.

Regardless, the trees are there. A count made from Landsat images revealed some 18 million shea butter trees between Bamako and Segou, cities 200 kms apart, representing a potential almond yield of 30 000 tonnes — 4500 to 24 000 tonnes of butter depending on the method of extraction. And this is only part of Mali's shea butter tree population.

At some level between large-scale commercial oil extraction for export and traditional extraction for local consumption, many people are attempting to introduce an efficient and simple extraction method that would enable villages to satisfy both local and external demand. In addition to the joint project with CEEPAZ, the Agricultural Mechanization Division of Mali's Ministry of Rural Development has undertaken to develop a press to extract the oil. The project, supported by IDRC, has only just begun, but it is anticipated that it will provide peasants with a machine that will double the yield while reducing the work involved. A good shea butter press would not only improve the quality of the butter, but would also enable the recovery of the by-products — now lost — for use as animal feed.

The development of a new technology for producing shea butter will probably have an enormous impact on women's lives. If they willingly submit to the hard labour involved it is because it is a source of personal income. What can they expect if the technology brings shea butter production into the realm of man's work? □

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### **AN APPROPRIATE REVIVAL**

Appropriate technology, based on local practices and traditional methods, can provide cheap and manageable production methods for poor farmers. This is the belief and *raison d'être* of Talpuy, a Peruvian group for the investigation and extension of popular technology.

Founded in 1979, Talpuy aims to identify and promote technologies currently used by peasants in the Valle del Mantaro, in Peru's central Sierra. The old technologies, slowly being lost, could continue to be of value to communities too poor to adopt modern farming techniques. According to the five young researchers who make up Talpuy, many indigenous farming and manufacturing methods, refined and used for centuries, are now unknown to the majority of peasants. This knowledge, they say, must be rediscovered, understood, and applied to solving real problems.

Three aspects of popular technology have so far interested them because of their potential for development. First are textile products, which provide an important part of farmers' incomes. Many of the traditional artifacts marketed in Lima



*Talpuy promotes popular technology in the Peruvian highlands.*

and other centres are now coloured with synthetic dyes. But the high inflation rate, combined with the rise in

price of petroleum products that are used for dyes, have forced the artisans to seek out alternative low-cost methods. Talpuy has published a book, which they hope will assist the producers, that identifies 40 natural dyes and explains their use.

A second interest has been the use of appropriate technologies for local energy generation and use, including windmills and irrigation devices. The development of food storage techniques rounds out Talpuy's interests.

To disseminate the information it gathers, Talpuy publishes a magazine, pamphlets and books, holds seminars and demonstrations at village fairs, and works through other groups with similar interests.

Funded by IDRC, Talpuy's researchers are now undertaking a more thorough examination of the process by which technical information is diffused. Some of their own and other attempts to change peasant behaviour through the use of appropriate technology will be examined and, based on this information, Talpuy will develop a plan that would be useful for the peasants and other extension organizations.





# WATER AND SANITATION NEED PEOPLE

*From village artisans to government planners, personnel at all levels must be trained if water supply and sanitation programs are to succeed in Africa*



It is the lack of human resources — trained personnel — that hinders the realization of many development programs. Certainly this is true in the field of water supply and sanitation, and it is one of the reasons why a number of countries will fall short of the “clean water for all” goals of the UN International Drinking Water Supply and Sanitation Decade (1981 - 1990).

In fact, more than half the countries surveyed by the United Nations in 1979 reported that the scarcity of qualified personnel at all levels — from village technicians to national planners — was the most critical constraint in extending water supply and sanitation programs.

The task facing these countries is undeniably formidable, but not impossible — if they set realistic targets and make optimum use of community resources and appropriate technologies. Training programs must also be stepped up and modified to reflect the new drive to universal coverage in the rural areas and to take advantage of the low-cost technologies now available to provide safe water and waste disposal.

To help disseminate information on low-cost technologies and discuss the implementation of curricula changes and training needs, IDRC cosponsored two workshops in August 1980, one in Malawi on water supply, the other in Botswana on sanitation. Planners, training officers, engineers, and administrators from nine East African countries met to learn about developments in neighbouring countries, gathering information that had not hitherto crossed national borders. Existing training programs were also reviewed and recommendations made for their improvement.

Rainwater catchment, gravity-fed systems, shallow wells, handpumps, and wind-powered systems are all possible water supply technologies for rural areas. But as workshop participants pointed out, not all are simple, nor are they necessarily low-cost. Windmills are a case in point: power potential, blade design, tower design and mechanisms, windmill-to-pump coupling, and groundwater characteristics as well as wind regime must all be taken into account.

Similarly, a wide range of handpumps, filtration systems, catchment methods, etc., are available. It became clear to trainers at the workshop that a variety of techniques had to be presented in training courses if water supply personnel were to make judicious choices.

After initial selection of a method and model, operation and maintenance must be assured. It was recognized that this can often best be done by local people, with technical backup when necessary. Because women are traditionally responsible for fetching water, they would be excellent candidates for training as water operators. Problems arise, however, because some cultures will not accept women in a technical role. Male engineers and technicians also experience commu-



nication difficulties — cultural and linguistic — in dealing with village women. And often, they haven't the time to devote to training.

As first steps to ensuring the smooth operation of the water systems, once installed, the participants agreed on the need for maintenance centres in the regions, for simple brochures in local languages explaining the systems' construction, operation, and maintenance, and for broad training of village water operators.

Educating users is also essential. For example, a common belief in Malawi is that diseases such as cholera and typhoid are caused by sorcery and witchcraft. Until relationships between water and diseases are understood, little progress can be expected. Communities must also feel responsible for maintaining the water system.

Community water committees could provide the needed leadership, management, maintenance, and education. It was also recommended that technicians and technical assistants be instructed in community development work, hygiene, and methods of educating villagers.

On the international level, workshop participants considered that water supply programs are hindered by the tendency of donors to limit their assistance to the provision of equipment. It was recommended that training be recognized as an integral part of all water supply programs.

If real improvements are to occur in people's health, sanitation programs must go hand in hand with improved water supplies. Unsanitary disposal of human wastes is, in fact, one of the most common sources of infection.

As in water supply systems, a wide range of sanitation options is available. According to Dr E.K. Simbeye, Principal Health Officer in Tanzania's Ministry of Health: "For many years, people in developing countries have regarded sewerage systems as the best method of dealing with excreta." While this may be the most sophisticated and hygienic method, he said, it is almost certainly the most expensive.

Attention is thus turning toward conventional, but simple and relatively cheap, on-site disposal — pit and compost latrines, pour-flush toilets and aquaprivies, and septic tank latrines. And while they are particularly suited to rural areas, they are gaining in popularity in some cities as well, particularly squatter settlements.

Latrines are probably the most popular on-site waste disposal systems, and although a number of countries have embarked on sanitation programs based on latrines, results have been mixed. Some countries like Botswana are making headway; others are experiencing almost insurmountable problems.

In Ethiopia, for example, the sanitation program has been underway officially for over 20 years. Yet, noted Dr K. Kinde of the Ministry of Health, public health has not improved. A sample survey has

shown that only one percent of the population uses pit latrines, and the few latrines that exist are improperly designed, constructed, and maintained.

While technical problems like poor construction can be remedied fairly simply, social and cultural factors are more difficult to overcome. Compost toilets, for example, are often unacceptable because users refuse to empty them. In some cultures, men are prohibited from using the same latrines as women. Small children are often barred from using them at all.

Workshop participants agreed that the choice of method and design must take into account cultural factors, availability of materials and capital, and other conditions such as the level of groundwater and soil permeability. But according to Dr A.W.C. Munyimbili, a Regional Health Inspector in Malawi, the manner in which people are encouraged to use the latrines is more important than the latrine itself.

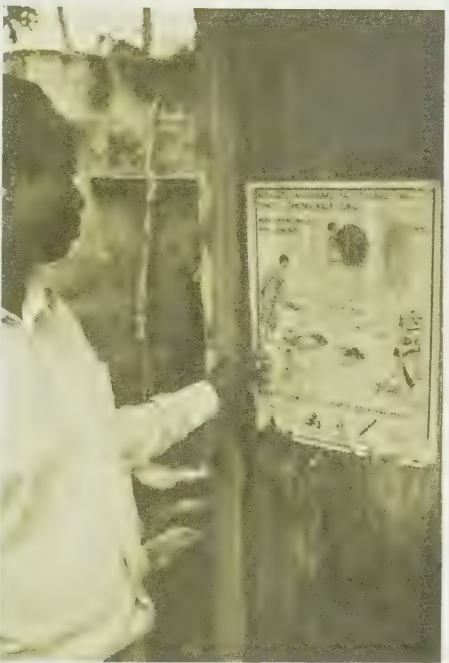
This requires community participation and awareness of the importance of sanitation. It was suggested that sanitation, hygiene, and basic operation and maintenance of sanitation units could be introduced in primary school curricula as well as in adult literacy programs. Community and development workers should be enlisted to provide continuing education.

The dearth of personnel at all levels will also need to be overcome. Participants called for increased training of engineers, technicians, and village artisans, and felt that the duties of sanitation personnel should include education in the villages.

As a follow-up to the workshops, most participating countries committed themselves to various actions, ranging from encouraging collaboration between water and sanitation agencies to identifying specific programs that could be carried out. National workshops are being proposed in Ethiopia, Tanzania, and Lesotho, and specific projects defined. Revision of training curricula will also take place in several countries. In Tanzania, a new program for training public health technicians or para-engineers is being established. In Ethiopia, a new cadre of personnel — the community participation promotion officer — is being proposed to provide liaison between the villages and regional offices of the water supply agency.

Greater efforts will be required nationally and internationally if the goals of access to safe water supplies and sanitation for all are to be reached. But real progress will only come by developing expertise from within. East African nations have made the commitment to do just that. □

*The proceedings of both workshops have recently been published by IDRC. Rural water supply in developing countries (IDRC-167e) and Sanitation in developing countries (IDRC-168e) are available from: Communications Division, IDRC, Box 8500, Ottawa, Canada K1G 3H9.*





## Energy bank running on empty

The proposed World Bank energy affiliate, which was to channel \$US. 30 billion into energy projects in developing countries, may be another victim of budgets cuts by the new us administration.

According to an account published in the *World Environment Report*, World Bank officials have been informed that the present administration "at this time . . . was not in a position to support or participate in the affiliate." This does not preclude us participation in the future, Bank officials say, and they are continuing discussions on the energy bank with other member countries. However, without substantial support from the USA, the energy-lending agency's future is now in doubt.

## Good gnus for meat production

Imported exotic breeds of cattle do not fare very well in the tropics of Africa. They require much water and forage, are prone to all manner of indigenous diseases and parasites, are fat and breed slowly — taking as much as two years between calvings.

By comparison, wild animals such as the antelope, eland, gazelle, and gnu are paragons of efficiency. They need only one-quarter the water required by cattle, make use of all the native plant life, are very lean, and have inbred disease resistance. And they are prolific — Thomson's gazelle, for example, requires a mere 44 weeks from the birth of one set of offspring to the next.

It should not be surprising then that animal pro-

duction experts are looking seriously at the potential of wild species to help meet Africa's food protein shortage. According to a report published by the United Nations Food and Agriculture Organization (FAO), wild animals produce more meat in a shorter time than domesticated cattle, and they are ecologically more efficient.

In Kenya, Tanzania, Uganda, and Zambia various programs are now underway to cull and control the herds on an economically sound basis. There are also experiments in rearing and managing wild animals, particularly those that can thrive on marginal lands. The eland, the gazelle, the oryx, and the gnu all show promise.

There are problems, of course. Wild animals are particularly susceptible to "imported" diseases such as foot-and-mouth. Poaching is widespread, and there are as yet few ready-made markets for wild animal meat. But the day is fast approaching when brindled gnu and blesbok may be as familiar table fare as beef and mutton.

## Vaccine rebellion

Tuberculosis remains endemic in Third World countries. Now, the famous BCG (Bacille Calmette-Guérin) tuberculin vaccine has been found ineffective in the Madras region of India. This is the conclusion reached after eight years of testing and follow-up by Indian public health authorities and two who teams of experts, who admit they are totally surprised by these results. Indeed, it appears that the incidence of tuberculosis has even increased among older men. More-

over, the ineffectiveness of BCG cannot be traced back to the methods used to administer it, the transportation conditions, or the handling of the vaccines.

The experts can only speculate about the causes: the presence of other infectious diseases with germs similar to Koch's bacillus (the cause of TB); slight differences in the Indian bacillus; unusual body responses to BCG because of the prevalence of leprosy; or other unknown factors.

Curiously enough, the same phenomenon of weak or questionable protection has been observed with the oral, or Sabin, polio vaccine, which can be ineffective in 70 percent of children vaccinated in Mexico, Ivory Coast, Thailand, India, and several other countries.

These facts serve to underline the importance that must be attached to epidemiological characteristics of countries about to embark on vaccination campaigns.

## Insects beware

A bacterium discovered by chance on dead mosquito larvae in an Israeli pond in 1977 is today the cause of much excitement. *Bacillus thuringiensis israelensis* (B.t.i.) can in fact kill disease-carrying insects like blackflies that spread river blindness and mosquitoes that transmit malaria.

Why B.t.i. kills certain insects is not yet fully understood, except that it paralyzes the digestive system of larvae that ingest it. But the specific B.t.i. molecule responsible for the toxic activity has not yet been identified.

*Bacillus thuringiensis* is

not a new bacterium. Several other strains are used extensively to control agricultural and forest pests in Europe, China, and the USA. According to Dr Jacques Hamon, director of the World Health Organization's (WHO) vector biology and control division, the new strain should also soon be approved for use by environmental regulatory agencies in Canada, France, and the USA. Leading pesticide manufacturers are already actively interested in large-scale production.

Dr Hamon is now planning to study how developing countries can be helped to produce this and other bacterial insecticides on a cottage level.

## Winged bean takes off

Sri Lanka will host the new International (Dambala) Winged Bean Institute (TIDWIBI), established to provide leadership in the development of this nutritious, fast-growing legume.

Above ground, the winged bean produces edible leaves, shoots, flowers and pods as well as seeds with a composition that virtually duplicates that of soybeans. But there's more to the winged bean than waves in the wind. Below ground, it produces a root vegetable that has an average protein content of 20 percent. (For comparison, potatoes, sweet potatoes, and yams average 3-7 percent; cassava, 1 percent.)

TIDWIBI was announced by Sri Lanka president J.S. Jayewardene during a public forum on the prospects and potentials of the winged bean held in Colombo earlier this year. Funding for the new institute — the first of its kind



to be established in the country, and the first international centre dedicated to the development of a single underutilized plant — will come initially from Sri Lanka and donor consortia. (*The SEARCA Diary*, Philippines)

### **Energy from palm wastes**

Efforts to clean up pollution caused by palm oil mills in Malaysia have hit upon a method that may not only clear the waters but also provide a substantial alternative energy source.

Palm oil production is big business in Malaysia, with annual yields of around 1.37 million tonnes. But the country's 200 palm oil mills were pumping so much effluent into the waterways that in 1974 the government introduced the Environmental Quality Act to force the mill operators to clean up their act.

The legislation required that all effluents be treated before being discharged. Scientists developed a fermentation technique using an anaerobic digester that effectively "cleaned" the wastes, and was found to produce considerable quantities of methane gas in the process.

The researchers now estimate that the average mill could produce the energy equivalent of 90 barrels of oil per day by this process — in addition to its normal output of palm oil. With the industry producing some 6.6 million tonnes of wastes each year, it could, in theory, meet one-eighth of the country's energy needs.

The catch is the capital cost, estimated to be about \$US. 80 million to convert

all 20 mills. But clean water is a priceless commodity, and with energies continuing to climb, that cost may soon look like a bargain.

### **Primer for African women**

Getting a development project off the ground requires money, detailed planning, and determined resource people.

To help African women navigate their way through the process, a women's training and research centre based in Addis Ababa has published a 192-page manual entitled *Information Kit for Women in Africa*. It tells prospective project leaders how to write a proposal, where to go for funding, and what literature to consult.

The African Training and Research Centre for Women (ATRCW), which published the kit in January in collaboration with the New York-based International Women's Tribune Centre, is an offshoot of the UN Economic Commission for Africa. It was set up in 1976 as a follow-up to International Women's Year.

Among other useful information, the kit provides a sample letter to a funding agency and a sample format for a project proposal. Helpful hints range from avoiding "professional jargon" in project proposals, to seeking funds from private companies operating locally.

In addition to listing 73 private, government, and UN funding agencies, this very readable manual summarizes 20 African women's projects in widely differing sectors, from small-scale irrigation in

Ghana to low-cost transportation in Kenya.

For more information, contact the ATRCW, UN/ECA, P.O. Box 3001, Addis Ababa, Ethiopia, or International Women's Tribune Centre, 305 East 46 St., New York, N.Y. 10017, USA.

### **Rural satellites**

Modern communications technology can be an appropriate rural development tool. That is the premise of the rural Satellite Program launched by the United States Agency for International Development (AID), at a cost of \$US. 24 million over the next five years.

The program will encourage the use of existing satellites and related technologies to provide vital domestic communications in rural areas of Third World countries. A co-operative effort between the USA and host country governments, it will support basic aspects of development such as health care, agriculture, adult literacy, and classroom education.

A limited number of small earth stations installed in host countries will make telephone services, radio broadcasting, and other communications services available to support rural development activities. Television broadcasting will not be used in the pilot projects.

To date, an agreement has been signed with Peru and negotiations are underway with the Philippines as well as a number of other Asian and African countries. The Rural Satellite Program will also support a number of policy studies to assess the financial, technical, regulatory, and international

environments in which developing countries must operate.

### **Information "digs"**

In traditional archival studies it is customary to speak of "stratification" and "sedimentation". Like true geologists, paleogeographers will show you the "pre-colonial" or "proto-revolutionary" layers that attest to the activities of successive governments. Access to different layers is not, and should not, be easy: to reach a mine of important information at a given level requires "excavating", in other words, removing the upper strata at the risk of damaging them.

Fortunately, however, there are avant-garde archivists who have asked themselves how they can make this information readily available to users. Mr Mathias Sack, Chief Curator of the National Archives of Cameroon, set out to find a way. He reached the conclusion that "all archival material which comes to the National Archives no longer belongs to the institution or the individual concerned, but becomes a part of the national heritage which must be made accessible to all users."

New material is "dissected" and each item is processed according to its information value, by function and not by origin, then subdivided into sectors and into subjects. Card catalogues are the main documentary research tool in the Cameroon Archives.

Given the African context, where development documentation is rudimentary, Mr. Sack's initiative is noteworthy.



MICHELLE HIBLER

# THE ALL-PURPOSE NURSE

**I**t is a slow morning at the Singburi District Hospital, some two hours' drive north of Bangkok, Thailand. Unusual for a Monday, just one of the hospital's 10 beds is occupied and the well-baby clinic has attracted only two mothers. Outside the hospital's front door, farmers and fishermen await the barge that will ferry them across the sluggish Chao Phraya river.

The hospital's main function is to provide medical care for the 15 000 people of the district, but prevention and health promotion are also important tasks. Apart from the daily outpatients clinic, special clinics are scheduled each day — dental care, well-baby clinic, maternal and child health, antenatal care, family planning, and vaccinations. School programs, as well as the supervision of outlying health centres staffed by midwives, are also part of the hospital's responsibilities.

The range of preventive and curative services rendered by the hospital accurately reflects the integrated health care program adopted in Thailand's Fourth National Health Plan (1977-81). Like most developing countries, the provision of adequate health care in rural areas has been a serious problem. Malnutrition, communicable diseases — both water-borne and vector-borne — respiratory ailments, and other illnesses take a severe toll. The death rate in rural areas is double that in the cities. More than 60 percent of the country's health personnel is located in Bangkok. In rural areas, one physician must serve up to 150 000 people.

As a result, nurses working in district hospitals and in health centres have been pressed into duty to provide types of services for which they were not prepared in their regular nursing training course.

Rather than create a new cadre of personnel to provide additional medical care, Thailand decided to train registered nurses already working in rural areas in preventive and curative medicine (including diagnosis and treatment of minor illnesses and emergencies), in public health, and in administration. Thus the Public Health Nurse Practitioner (PH-NP) came into being in 1973, when the Faculty of Public Health of Mahidol University began a pilot program offering a one-year course leading to the PH-NP Diploma.

Encouraged by the results of the pilot project, the Ministry of Health adopted the program and, in fact, the National Health Plan calls for the training of 1400 nurse practitioners by the end of 1981.

Nurse Kannigar has been at the Singburi hospital for a year now. She is one of 60 PH-NP throughout the country who have been selected for an in-depth study by Mahidol University. Funded by IDRC, the study seeks to determine the nurse practitioners' efficiency and effectiveness, and their acceptance by the people served. It will assist the Faculty of Public Health in identifying training areas that need modification or strengthening, and aid the Ministry of Public Health in its deliberations over expanding the program.

Today, the project study team is carrying out its second observation of Nurse Kannigar at work advising, examining, and treating patients. Her administrative skills are also being assessed through a review of the records she has kept and through interviews with her co-workers and patients. Patients and their families are also being asked about their degree of satisfaction with the care provided. Data on the utilization of PH-NP and the management support given them in carrying out their duties is also being collected. Finally, a cost analysis of the program will be carried out.

One older woman with a chest complaint has come this morning. Another patient is needed to complete this observation tour. Eventually — and not without some coaxing — the ferryman comes in between passengers to have a swollen ankle tended to. The diagnosis: poor blood circulation, perhaps not surprising at his age. He is 79.

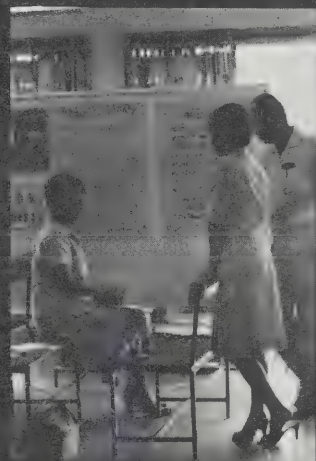
The results of the evaluation, due to be completed later this year, will not only assist Thailand in determining the future orientation of the program, but should provide important information on the validity of the public health nurse practitioner approach for other countries — developing and developed — considering or implementing similar programs.

And, according to Dr Prabha Limprasutr, Head of the Department of Public Health Nursing and project coordinator, there is another benefit: it is the first time she and members of her staff have had the opportunity to visit rural hospitals, clinics, and health centres throughout the country to see the needs and problems for themselves. □

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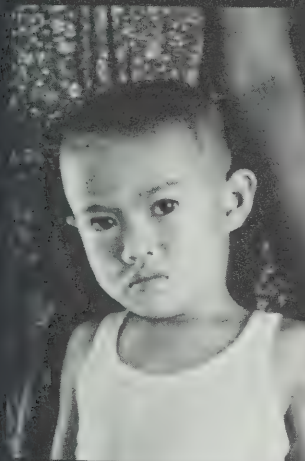
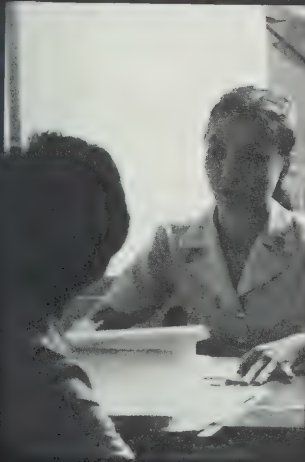
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*A day unfolds at the Singburi District Hospital on the banks of the Chao Phraya river (above top) as a team from Mahidol University comes to observe nurse-practitioner Kannigar at work. Above and right: Patients and their families are interviewed and nurse Kannigar's performance is assessed. The last patient of the day is the 79-year old ferryman (far right).*





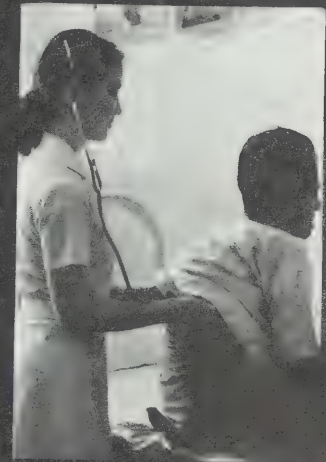
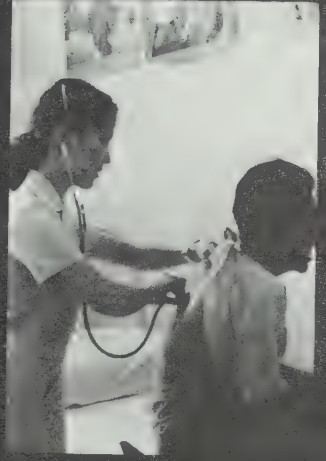
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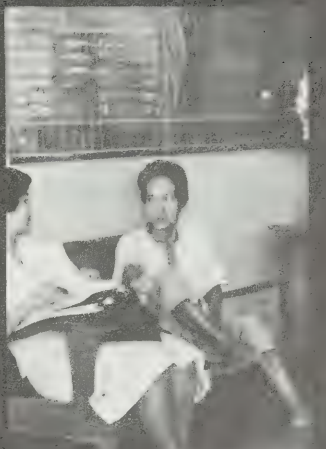
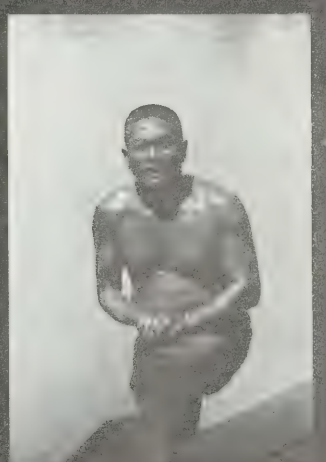
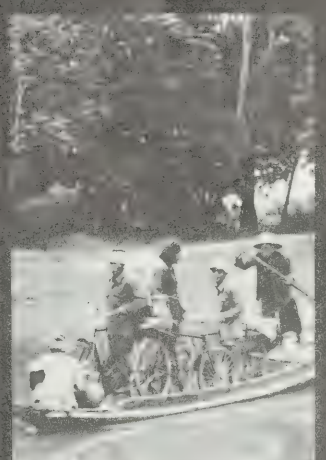
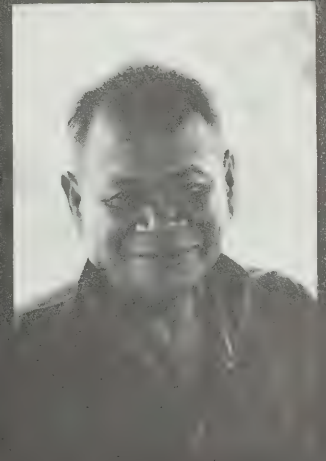
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# TAKING AIM AGAINST HUNGER

ROWAN SHIRKIE

**W**hen the conference that established the Food and Agriculture Organization of the United Nations (FAO) was held in Quebec City, on 16 October 1945, the world food situation was critical. Production had been forced into restricted patterns, and normal distribution of food supplies had been violently disrupted by a global war.

The objectives of the new organization then were to promote the common welfare of its member nations by "raising levels of nutrition and standards of living of the peoples under their respective jurisdiction; securing improvements of the efficiency of the production and distribution of all food and agriculture products; and bettering the condition of rural populations and thus contributing toward an expanding world economy and ensuring humanity's freedom from hunger."

Hunger still holds much of humanity in chains today, and the effort to feed the world is still on a war footing. The opening shot of a new campaign to meet the objectives set before the United Nations' first-born agency will be fired Friday, 16 October 1981, soon to be better known as World Food Day. The 36th anniversary of the founding of FAO, that day will mark the beginning of a global effort to draw public attention to the severity of world hunger and promote efforts to overcome it.

It is an anniversary with little to celebrate. FAO estimates that the number of severely undernourished people in developing market economies (the developing countries not including China or the other Asian centrally planned economies) rose from some 360 million in 1969-71, to about 420 million in 1974-76, to more than 500 million today.

Poverty is the main cause of hunger. It also increases the havoc that climate or political events can wreak on food supplies. Price hikes caused by shortages hit hardest at the poor, because they must spend a larger part of their income simply to eat.

Developing countries are obviously the most affected by malnutrition, but industrialized countries are not exempt. In Canada, for example, many elderly people, native populations, and single-parent families live

below the poverty line. And even affluence has its nutritional price. The degenerative diseases of the heart and digestive system that are major health problems of the developed countries result from overeating and poor diets.

Canada is indeed fortunate in having cheap food in abundance, and a vigorous agricultural industry — agriculture contributes almost a third of Canada's gross domestic product. Canada and the USA together

Food Day is planned to give all people a chance to join together and demonstrate their commitment to ending hunger.

Canada has a special role to play in World Food Day. The FAO was created here, in no small part due to the efforts of Canadians like the late Lester B. Pearson, who was Chairman of the Quebec Conference in 1945. As one of the leading food-producing nations of the world, Canada continues to contribute human, financial, material, and technical resources to international food programs.

Canada has chosen as its theme "Food for all", and has begun organizing activities to give individual Canadians an opportunity to, in Mr Whelan's words, "put their own views on food and world nutrition into clearer focus," and to act on them. Representatives of federal and provincial governments, development agencies, voluntary organizations, and producer and consumer groups have formed a coordinating body to plan for World Food Day. Some of the proposed activities include public lectures, exhibitions, television specials, poster and essay contests, and "hunger suppers" as well as other fund-raising events. A national World Food Day Coordinator has been appointed to provide support and resources to individual initiatives.

Worldwide, activities range from special issues of coins and stamps, to schoolchildren's gardening exercises. Some countries, like Burma and Mauritania, plan to honour their farmers with special awards for outstanding production achievements. Indonesia will be holding a special television panel on food issues, including the Minister of Agriculture and farm-level representatives. Zaire is planning farming and fish farming demonstrations — many countries are turning agricultural fairs or festivals into World Food Day events. Coordination and information on international activities are being handled by the World Food Day Secretariat, FAO Headquarters, Via delle Terme di Caracalla, 00100 Rome, Italy.

For more information on World Food Day in Canada, contact the World Food Day Coordinator, Agriculture Canada, Ottawa, Canada K1A 0C7. □



hold more than 40 percent of the world grain reserves, take a two-thirds share of total world grain exports, and supply two-thirds of all food aid. The abundance of North American agriculture is "the world's last line of defense against famine" says the FAO.

To whom much is given, much will be required. As Agriculture Minister Eugene Whelan pointed out in a speech launching World Food Day activities in Canada, "Many Canadians do have a deep desire to share the wealth we have with others around the world. But we need to be moved; we need to feel that we are making a personal contribution — actively participating in the world, helping in our family of nations and not just sitting numbly watching it flickering by on the television set."

The idea of a community of nations has little meaning, the Brandt report on international development issues points out, while it allows millions of its members to die or be permanently disabled from lack of food. World

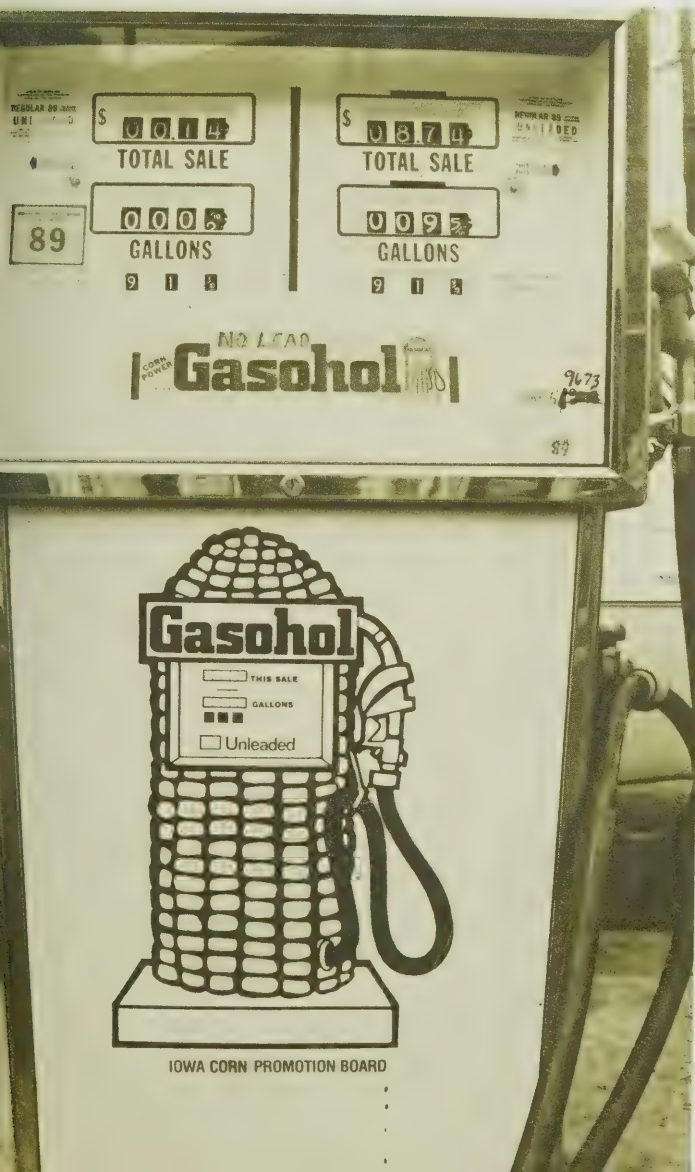


*Food and fuel needs  
come into conflict  
over the use of  
agricultural resources*

# FUELLING CONTROVERSY

ROWAN SHIRKIE

Photos: DOE/Jack Schneider



The age of uncertainty began in 1973 when increasing oil prices, supply control, and the politics of petroleum created severe economic hardships and energy insecurity among oil-importing countries.

Rapidly mounting foreign debts and the strategic importance of energy for production, defense, and transportation made the search for alternative energy sources an urgent priority in oil-deficit nations.

Perhaps the most attractive alternative is alcohol fuels produced from plant sources: methanol from wood, and ethanol from sugar and starch crops. No other replacement fuel offers the same qualities of portability, high energy concentration, or extensive familiarity and use.

The appeal of alcohol fuels has become irresistible. They can be produced anywhere that plants grow, not concentrated in a few locations and subject to political control. And the source appears almost infinitely renewable, being regenerated year after year.

The prospect of energy independence through agriculture is clouded by only one unresolved conflict: agriculture is already under considerable pressure simply to produce enough food to feed the world's ever burgeoning population. An FAO (Food and Agriculture Organization of the United Nations) study, *Agriculture: toward 2000*, estimates that to meet the growing demand for food, industry, and export, agriculture in developing countries would need to grow almost 40 percent faster than in the past. Any additional demands on production — particularly one of the enormous scale and strength of the demand for energy — seems impossible and destructive.

And in the developed, food-surplus countries, any significant production of alcohol fuels from agricultural commodities

seems likely to displace food exports to the developing countries, price them considerably higher, or both.

Critics of energy cropping charge that ingenuity and greed in the North have combined to invent a way of taxing the world's poor to support the energy profligacy of the rich. The situation has a unique symbolism that compresses the history of relations between the developing world and the developed into a few conflicts: fuel versus food, automobiles versus people, rich versus poor.

Advocates hold, however, that once anticipated, the potential dangers of energy cropping can be avoided. They feel that the benefits to be gained in terms of energy self-sufficiency and economic stimulation far outweigh any costs, arguing that the right combination of technology and rational resource management will increase agricultural production and stabilize it for both food and fuel uses.

## SWEET AND STRONG

Ethanol is conventionally manufactured by fermentation through which microorganisms such as yeasts convert simple sugars into alcohol and carbon dioxide. Some plants yield fermentable sugars directly, others produce starch and cellulose that must be converted to sugar. Once the sugar has been fermented, the beer thus formed is distilled to remove water and leave refined, fuel-grade alcohol. Novel technologies are also being developed to use genetically engineered bacteria to convert starchy and woody materials directly into ethanol in a much simpler and more efficient process.

Automobiles can be run on "gasohol", gasoline mixed with up to 20 percent alcohol, without any engine alterations, and can be run entirely on alcohol with some redesigning. Ethanol is a gasoline enhancer: it boosts octane rating that would otherwise entail



more refining expenses, and turns lower grade gasoline into the equivalent of premium unleaded.

The best crops for energy production are sugarcane, sweet sorghum, maize, and other grains, as well as cassava and similar starchy root crops. Sugarcane and sweet sorghum give the highest yields of ethanol per hectare after processing, but other considerations may dictate which crops will end up in fuel tanks.

The USA, for example, has concentrated its efforts on maize fuel production systems. Sugarcane cannot be grown widely enough in the temperate areas of North America to be considered as a feedstock, and sweet sorghum, although it may be destined to become the "sugarcane of the North" given further development, is not commercially cropped to any significant extent. Brazil has made major strides with an alcohol program based on sugarcane, and is beginning to phase in cassava as a feedstock.

There has been a wide divergence of opinion on whether alcohol production from biomass makes good economic sense. The instrument used to analyze costs and profits is the net energy balance, which calculates all the energy used to produce ethanol: production energy used as fertilizer, and for irrigation and harvesting; the energy used to construct the distillation plant, and transport crops to it; and process energy required in the actual conversion into alcohol. According to the US Department of Energy, the energy cost of a litre of ethanol from maize is greater than the energy yield.

But most calculations are based on a set of circumstances that are rapidly changing. The net energy loss balance sheet assumes that maize is processed in conventional oil-fired distilleries and that the energy used to grow the maize is in the form of petroleum-based fertilizers, irrigation power, etc. Using other

sources of energy to power distillation, such as solar or coal, yields a net gain of 2 to 4 times the volume of fuel invested.

In this equation, sugarcane becomes especially attractive, because the waste stalk material — bagasse — can be burnt to provide energy. A potential disposal problem thus becomes an energy credit. Other credits accrue to alcohol fuel production. One most often presented as a powerful argument for fuel production from maize is the use of the distillers' grain byproduct as animal feed. Maize retains its original protein value through distillation (and even gains a little with the addition of yeast), and can be fed to livestock. Protein feeds such as soybeans could thus be replaced in farm budgets.

The bottom line is: ethanol production, at least in countries like the USA, is economical. Production has generally been subsidized through tax cuts and cheap loans in order to encourage rapid expansion of ethanol production as part of a strategy for energy self-sufficiency. But as the cost of imported oil continues to rise, gasohol fuels are expected to be competitive without any sort of government intervention.

The price relationships in the USA are not applicable in all other countries, but they illustrate the general operation of ethanol programs. In other countries, feedstock prices might be lower, distilling costs higher. One country that appears to be making the economics of alcohol fuel work is Brazil.

#### THE CASE OF BRAZIL

Brazil was importing 85 percent of its oil, spending an estimated \$US. 6.5 billion annually in 1979. The outlay would certainly have been even greater but for the savings generated in the early stages of a national alcohol fuels program begun in 1975. By last year, Brazil had expected to replace 20 per-

cent of its total automotive fuels.

Brazil has also begun manufacturing cars that operate exclusively on alcohol. With conservation measures and a largely alcohol fleet, Brazil expects to reach its goal of complete automotive fuel self-sufficiency by the year 2000, when ethanol production hits 70 billion litres a year.

The program is presently based on sugarcane. The most efficient of the present feedstocks, sugarcane yields over 3000 litres of alcohol per hectare, or about 65 percent more than maize. To achieve self-sufficiency by this route, Brazil will need to plant almost three percent of its land area (seven percent of arable land) to sugarcane. At that point, Brazil will be growing more sugarcane than the rest of the world put together.

While the desire for energy independence is the driving force behind the alcohol program, Brazil also plans to reap other benefits. Sugarcane production lends itself to efficiencies of scale in concentrated, large-scale operations. On the other hand, cassava, a starch-rich root crop native to Brazil, is well-suited to small farm production and marginal lands. Cassava ethanol operations may be a means to create employment and income opportunities for the rural poor and extend development activities in areas where they are most needed.

Other developing countries are adopting similar strategies. Cassava exports to feed Europe's livestock are Thailand's principal source of foreign exchange earnings. Ninety-five percent of Thailand's cassava crop, grown by smallholders on poor upland soils in the impoverished east and northeast of the country, is exported. Thus, the livelihood of millions of small farmers is tied to export markets. As pressure is brought to bear by European producers to restrict trade in Thai cassava in favour of regionally produced feedstuffs, these markets may become increasingly uncertain.

Although energy savings are important in Thailand, the stabilizing effect of a domestic market for cassava on prices and incomes must be a strong incentive for considering an alcohol program. Kenya and the Sudan are reportedly establishing alcohol distilleries to convert the molasses byproducts of sugar mills into fuel, and many sugar producing countries are showing a strong interest in developing fuel production capacities.

#### COMPETING CLAIMS

Agriculture is already pressed to supply food and fibre to meet the world's needs. And although world production has been increasing in the last few years, it is not growing fast enough. Population growth rates continue to surpass agricultural production, and most of the recent increases in food supply succeeded simply in maintaining diets at their present levels for a greater number of people.

The additional demands for fuel ener-



*Cassava for animal feed in Thailand: stabilizing markets.*



gy crops on the agricultural resource base could create a very dramatic confrontation. As Lester Brown, senior researcher of the Worldwatch Institute, says: "The stage is set for direct competition between the affluent minority, who own the world's 315 million automobiles, and the poorest segments of humanity, for whom getting enough food to stay alive is already a struggle."

If energy cropping diverts land from food production and reduces the amount of food available to the poor by either raising prices or reducing supply, then world confrontation and catastrophe seem almost certain.

Few hard facts are available on the effects of energy cropping on food supply or prices, but speculation abounds.

The United States is the world's largest exporter of agricultural products, with a market share of over 17 percent. About three-quarters of the total value of these exports comes from wheat, maize, and soybeans. The USA produces about 20 percent of the world's total grain production (Canada accounts for about the same percentage). Countries like the USA, Brazil, and Thailand, which export a considerable portion of their food production and are dependent on oil imports, are most interested in the potentials of energy cropping. Should production emphasis shift towards fuel rather than food, the amount of food available on the world market for food-deficit countries could be squeezed sharply.

Per Pinstrup-Anderson, program director for consumption-nutrition studies of the International Food Policy Research Institute presents a gloomy scenario if this occurs: food prices on the world market would rise, real incomes of the urban poor would fall, and more people would suffer from malnutrition. And as food prices increase, the relative profitability of food production and energy cropping will change to favour food again. At some point, Dr Pinstrup-Anderson speculates, a balance will be struck where the division of agricultural industry between food production and energy cropping will be a function of the relative prices of their products. When that happens, food prices will be tied much more closely to the price of oil. Increases in oil will make energy cropping more attractive, which will shift production away from food, which will drive food prices up . . .

Wallace Tyner, Purdue University Professor of Agricultural Economics, disagrees. "Maize is the grain most often discussed as a feedstock for alcohol production in the USA. At current market prices maize is a cheaper feedstock than wheat, sugarcane, sugar beets, or molasses. Since maize is a feed grain and is not consumed directly by humans in large amounts, a more correct characterization of the food/fuel issue would be the food/feed/fuel issue." Addressing a symposium on food and fuel conflicts at the recent meeting of the American Association for the Advancement of Science, Tyner pointed out that

less than four percent of USA maize production is consumed in developing countries as food or feed. The impact of using large amounts of maize for ethanol production would be increased costs of meat, dairy, and poultry products, he said. The effects would therefore be strongest in countries where animal products are an important part of the diet, that is to say, the rich countries. Consumers would tend to shift to cheaper animal products — from beef to poultry, for instance.

Critics of alcohol fuels programs — and particularly the USA program — say that the "maize is not human food" argument is specious. For one thing, maize *is* an important staple food in developing countries. More important, concerns are not focused on the question of whether diversion of one particular crop away from food into fuel will have more or less direct impact on food supplies. It is in the *competition* for land, water, fertilizer, agricultural credit, and other inputs that the real



*Sorghum in Ethiopia: will it fill stomachs or gas tanks?*

crunch will come. If maize displaces wheat on prime land in exporting countries, or cuts into wheat yields by diverting land and water resources, then the fuel versus food conflict is clearly harmful to the poor in developing countries.

The potential conflict over land use may be "more imaginary than real" in countries with adequate agricultural resources and where new land can be brought into production at a reasonable cost, according to Harinder S. Kohli. Kohli, chief of the fertilizer, refining, and other chemical industries division of the World Bank, and member of the National Academy of Sciences panel studying the potential of alcohol fuels for developing countries, says government policies aimed at reducing the cost of raw materials for biomass energy can reduce the competition between food and fuels crops. "Increased yields per hectare of traditional energy crops are usually possible," he says, and the overall land requirements for energy significantly lessened.

New energy crops can be used to squeeze more fuel from lands presently in production. "Annual alcohol production per hectare from sweet sorghum, for example, may be as much as 50 percent greater than sugarcane," Kohli notes, and energy cropping on marginal lands can avoid conflicts altogether.

#### AVOIDING CONFLICT

But perhaps the soundest strategy for long-term fuel and food production lies in developing new technologies and processes that convert the woody cellulose fractions of plants to alcohol. Crop wastes and residues, and forest products can become important sources of fuel, provided scientists can overcome cellulose's natural resistance to bacterial attack or degradation.

Researchers like Dr Murray Moo-Young, whose work at the University of Waterloo (Canada) is supported by an IDRC fellowship, hope to do most of the vital engineering work on alcohol production from cellulose at the submicroscopic level — combining the cellulose-converting genes of certain bacteria with the fermenting genes of yeast to produce "superbugs" that at once simplify alcohol production and expand its potential resource base to include virtually anything that grows.

Food production itself is becoming increasingly dependent on energy inputs, some of which could be supplied by alcohol. The FAO study on the future of agriculture considered an increase of 107 percent in production levels both desirable and feasible. To achieve such an expansion, "very large increases in the use of energy-intensive inputs are estimated to be required," say the FAO forecasters.

Commercial energy use in agriculture must rise by an estimated 380 percent during the next 20 years. The bulk of this energy will be consumed by farm machinery (about 51 percent), followed by fertilizer production (about 45 percent).

Rather than compounding an already serious problem, energy cropping may — with enlightened management — help the world meet food needs. For all his dire warnings, Lester Brown admits that "... a carefully designed alcohol fuel program that gave farmers first priority in the use of ethanol for tractors, farm trucks, and irrigation pumps would help ensure future food supplies when oil supplies dwindle."

Harinder Kohli opens the same door by proposing "strong and complementary policies" as essential to accommodating the different needs of various sectors of the economy. "Ethanol production from biomass would require close coordination between the industrial, agricultural, energy, and transportation sectors."

Little in the history of human affairs justifies being optimistic that such coordination would occur without some major common threat forcing it. Perhaps the combined food crisis and the energy crisis present sufficient motivation.

□



# A PEA

## FOR ALL SEASONS

MICHELLE HIBLER

The small test kitchen of the Department of Food Technology at Khon Kaen University in northeastern Thailand is a busy place. A home economist and her assistant are grinding, chopping, boiling, frying. Traditional mortar and pestles and village-type woks clatter alongside modern implements and a new gas range.

The dishes being prepared are traditional foods of Thailand's northeast, but with a difference. All of them include cowpeas, a legume that has rarely before found its way into the soup.

One-third of Thailand's population lives in the poor semi-arid northeast. Surveys have shown that the average annual income of families — largely subsistence farmers — is about \$US. 130. Glutinous rice and raw leafy greens or green papaya, supplemented with a bit of fish paste or soup, is the usual fare. Consequently, an estimated 90 percent of the population suffers from malnutrition, not only because high quality foods are priced out of reach, but because of a lack of knowledge of methods of food preparation. Children and pregnant or lactating mothers are the hardest hit, receiving on average only half of the recommended daily protein intake.

Legumes such as soybeans, mung beans, and cowpeas are a relatively cheap source of protein, and while they are available in parts of the north east, they are not consumed in sufficient quantities to overcome nutritional deficiencies. Peanuts and mung beans, for example, are grown where there is irrigation, but they are destined for cash markets rather than the family cookpot. String beans will grow year round, but because they also require irrigation, are not widely available, nor do they have as high a protein content as dry legumes. A local cowpea has been grown, but not in sufficient quantities. In any case, it is consumed as a green vegetable rather than as a dry pulse and so is only available in season. In fresh form, cowpeas have much

*Introducing improved food crops is one thing — getting people to eat them is quite another*

less protein than as a dry pulse.

In an attempt to improve the diets of the population, the Ford Foundation and IDRC have been supporting multiple cropping projects to promote the cultivation of soybeans and cowpeas as dry season crops throughout the region. However, the lack of a market and of knowledge of ways to process and use the legumes has meant that farmers have been reluctant to grow them.

The Food Products Department at Khon Kaen has been working on solving this problem since 1978, with IDRC support. First the department carried

out surveys of eating habits in 10 villages, including five where multiple cropping projects are underway. Half of the farmers surveyed grew cowpeas, and although 87 percent of the villagers ate them, they did so less than once a month, and then only in fresh form and in small quantities. Yet they claimed to like the taste. Storage was one of the problems identified as limiting consumption of cowpeas in pulse form. Because they are prone to rapid and heavy weevil infestations, farmers disposed of them as quickly as possible.

The researchers set about formulating recipes for 50 of the main course, dessert, and snack dishes that they identified as the most popular during the surveys, adding whole cowpeas or cowpea paste to the usual ingredients.

The "fortified" dishes were evaluated for nutritive value, cost, and acceptability. Fourteen main dishes — mainly soups, stews and vegetable dishes —

and 11 snacks and deserts were selected for their high protein content and ease of preparation in the home or by small food vendors, who typically produce and sell most desserts and snacks. Each recipe was then readjusted to include the maximum cowpea content. A taste test panel composed of women from the university's experimental farm selected five main dishes and five snacks for wider testing.

The recipes were also tried using soybeans instead of cowpeas, but were not successful because of the soybeans' hard texture. The researchers feel that the best use for soybeans would be in the usual processed forms — flour, soybean curd, or sprouted, or as soybean milk which is widely available in Thailand.

To solve the storage problems, the cowpeas were subjected to various drying and storage tests. A technique for oil-treating the seeds, developed by the International Institute of Tropical Agriculture (IITA) in Nigeria, proved the best for long-term storage, but adversely affected the taste of the cowpeas. After dehulling, how-



*In the test kitchen of the Department of Food Technology at Khon Kaen University in Thailand, traditional foods are prepared using cowpeas.*



ever, the oil-treated samples were found to be acceptable. Simple, closed cotton bags proved adequate for storing small quantities of cowpeas for a few months under typical household conditions.

The researchers then moved out into the villages. Teachers, trained at the university in the preparation of the 10 sample dishes, held cooking demonstrations for villagers and handed out packages of cowpeas with recipes. Follow-up interviews showed that the test dishes were well liked and had been cooked successfully in the homes, except for those that required dehulling the cowpeas first. Half of the families had even kept back some of the cowpeas for planting in their gardens.

The food vendors were brought to the university for a day's training in the preparation of four newly formulated snacks. They responded enthusiastically to the products, and took their enthusiasm — and sample of cowpeas — back to their shops and streetcorners.

While the researchers were encouraged by the favourable reactions to the cowpea foods, they realized that before use and production could be expected to increase significantly, more convenient ways of processing the legumes were needed. The traditional way to process cowpeas is to soak them, then dehull by hand — a long and tedious process. The soaked beans are also prone to fermentation and sprouting, and cannot be milled into flour. The soaking itself can pose problems because of the quantities of clean water needed.

The researchers compared the milling characteristics of some 20 varieties of cowpeas. The Red Cowpea was found to be relatively easy to hull after soaking, but its hard coat made dry dehulling — grinding between stones — an arduous task. As small rice mills are scattered throughout the area, it was decided to see if the existing equipment could do double duty and mill cowpeas as well as the rice crop. All of the models tested were found unacceptable because of high breakage and losses of the seeds.

The poor performance of local mills encouraged the researchers to try a smaller, modified version of a dehuller developed by the Prairie Regional Laboratory in Saskatoon for dehulling African grains (see *An end to pounding, Reports* Vol. 9 no. 1). The machine, called the "roll-over" dehuller, performed well and vendors to whom it was demonstrated during recipe training were satisfied with the results.

To facilitate the next step — separating the hulls from the grains — a member of the research team developed a small mechanical sifter, simple enough to be built by village craftsmen using local materials.

Introduced into the village, the "new improved" dehulled cowpeas proved popular and many of the recipes that had been ignored before were put to use. The researchers now feel that the dehulled legumes have a good chance

of gaining wide acceptance.

To ensure maximum utilisation of cowpeas, a second phase of the project is now underway to develop means of processing and using cowpea flour. The dehulling trials are continuing in order to determine the ideal conditions for dehulling cowpeas and other local legumes. Local rice mills are being tested for grinding the dehulled beans into flour. So far, they perform satisfactorily.

To use the flour, convenience recipes are being developed for various puffed and fried snacks typically sold by small vendors, and for making the flour into a basic food paste. A food texturizer has been built of motorcycle parts and is being tested for producing puffed products, not only using cowpea flour but also various mixtures of cowpea and other flours — rice, maize, sesame, pumpkin, taro, and other local crops. To date, up to 50 percent cowpea flour has been added, while maintaining tasty results.

The dishes will undergo the same extensive testing as the whole cowpea and paste foods to ensure their nutritive value and consumer acceptability. Stor-

age and packaging studies will also be carried out.

The favorite recipes will be published and circulated to cooking class teachers, housewives, and women's and government organizations. More small vendors will be trained and encouraged to produce the foods for sale. A small-scale food processing unit using the equipment developed at the university will also be established in one of the cowpea-producing villages to assess the feasibility of producing the snacks commercially.

"We have to show people what this product can do", says Suwayd Ninsanoand, acting project leader, "that is our responsibility." Suwayd and his colleagues are optimistic that the recipes will gain acceptance and that consumer demand will pull the program forward. In fact, some of the villagers may even now be eating cowpeas inadvertently. In their enthusiasm, the researchers have been using cowpeas wherever possible, including in the soy sauce they produce for sale at the university's annual agricultural fair. The sauce has acquired the reputation of being the best around! □

## CONSUMERS HAVE THE LAST WORD

The massive research efforts of the past few decades to increase food production in developing countries have produced new varieties of crops with higher yields, shorter growing seasons, and greater resistance to drought, pests, and disease. New grains have been developed, old standbys restored to places of prominence, and staple food crops of one continent transplanted to another across the world.

In many instances, however, the beneficial impact of these developments has been offset by tremendous postharvest losses. Increases in production have put additional pressure on already inadequate handling systems, and many new food crop strains have been unsuited to existing processing technologies.

As part of its postproduction program, IDRC has supported projects to overcome these constraints in the food chain from harvest to consumption.

Perhaps one of the most difficult obstacles is getting people to change their age-old eating habits, or alternatively, devising ways of incorporating the new foods into those eating patterns.

Some of the Centre's projects in this area have focused on the quality characteristics of traditional food crops, on developing products using these crops, and on improving processes for widely consumed foods and products. Determining the physical, chemical, nutritional, and functional properties of food crops is in

fact essential for establishing consumer-based standards. These standards can then assist plant breeders to select the most appropriate cultivar for any given region.

Another series of projects evaluates the quality of local legumes for inclusion in traditional foods. In Indonesia, ways of using velvet beans — a low-cost nutritious substitute for soybeans — to produce *tempeh*, a fermented food, are being developed.

Some studies are also carried out to use alternate ingredients in existing processing methods. In Chile, for example, soybean processing techniques are being adapted to lupine, in order to substitute the local legume for imported soybeans.

But, in the final analysis, time constraints and the homemaker's processing knowledge and skills will determine what families eat. An awareness of these factors, along with knowledge of food habits and the nutritional contribution of local foods, can greatly assist in improving all stages of the food supply system. By surveying how products are used and liked, valuable information is gained for designing and evaluating other postproduction operations.

Just as no one step in the postproduction system can be viewed in isolation, neither can postproduction be divorced from overall efforts to increase food production. It is only by working directly with the consumers that scientists and administrators can ensure that programs have the intended benefits.



## TECHNOLOGY: WHAT IS APPROPRIATE?

**A**ppropriate technology has been held to be all things to all people by its advocates — from a mechanical path to enlightenment, to a sustainable economic growth plan for the post-industrial world.

In his book, *Paper heroes: a review of appropriate technology*<sup>†</sup>, Witold Rybczynski plays skeptic and historian to this populist approach to science and technology.

Rybczynski is a professor of architecture at McGill University (Montreal, Canada) and a "confessed practitioner" of appropriate technology whose work on low-cost housing and sanitation technologies<sup>‡</sup> has given him a special insight. Associate editor Rowan Shirkie interviewed him for Reports.

**Reports:** You say that appropriate technology is part lay religion, part protest movement, and part economic theory. In what proportions are they mixed?

**Rybczynski:** That is very difficult to say. I've been criticized for not defining appropriate technology, but I think that if one wants to deal with the phenomenon of appropriate technology — and it certainly exists — one really has to deal with a number of very disparate things. Depending on *where* and in *what* context it is being discussed, it can be very different. For instance, the idea of appropriate technology in the context of the World Bank or the United Nations takes on a very different colouration than when it is being discussed in the context of a national lending agency, or in the context of the United States' or Canada's "back-to-the-land" movement. So many people have taken part in this movement that it's not so much that it combines philosophical, economical, and almost religious ideas, but that depending on whom you are talking to, one or other

of these tendencies will emerge.

**Reports:** If it's only appropriate to any one individual, how can there be a consistency that you can call appropriate technology?

**Rybczynski:** There are two tendencies within appropriate technology which are more or less coherent or consistent. On the one hand, there is a tendency to deal with appropriate technology as an intermediate technology or as a stepping stone in the development process. This is an evolutionary position — the ultimate goals of technology are not different, but the way of achieving them has to be different.

On the other hand, you have within the appropriate technology movement a much more revolutionary position based on the assumption that technology is now inappropriate and must change very much more radically. It's a question of changing the goals of society, and that one way to change how development occurs — and, in fact, the goals of development

— is to change technology quite radically.

**Reports:** Do you think Schumacher originally formulated a revolutionary technology?

**Rybczynski:** He was a very difficult person to pin down: you can find a quote to support almost any position in his writing. He was once asked why he called his theories Buddhist economics, because it didn't seem to be very different from other sorts of economics. Schumacher replied that if he called it something else, people wouldn't have particularly noticed it. The Buddhist economics has less to do with Buddhism than with fairly conventional, welfare state economics.

I think what motivated Schumacher was a disillusionment with the direction that economic and social development had taken in Europe and America. *Small is beautiful* reflected, and perhaps expressed in a clearer way than people could have recognized themselves, a discontent and a search for alternatives. I have called the book first and foremost

a diatribe against modernization.

**Reports:** Why do you say in your book that "small is not always beautiful"?

**Rybczynski:** If we have been choosing the wrong technologies, is there a different type of technology that will put us on safer ground, whether environmentally, socially, or economically? If there is such a technology, one has to find some sort of criteria to identify it. I think nobody consciously chooses inappropriate technologies, or very rarely. Most of the bad choices of technology result because the choice was badly made.

Schumacher's argument is that there must be a technology — which he calls appropriate — that avoids these pitfalls. I was trying to identify some criteria of appropriateness, and one of the criteria he used seems to be smallness of scale. He actually claims that if we choose smaller technologies, we can avoid ecological fallout, for instance, because the smaller scale technologies are less likely to have undesirable effects. My finding is that there are enough examples where that is not true to make one suspicious.

There is more to appropriate technology than a literal reading of the word. Behind appropriate technology is a whole range of ideas that have to do with a lot more than simply choosing the right technology. It has to do with a whole philosophy.

In this light, Gandhi could be said to be the first, authentic, appropriate technologist, and his influence is great. Schumacher quite frequently mentions Gandhi, and Schumacher did have some early experience in India which was one of the things which led him to formulate his theory of intermediate technology. I think the links between the appropriate technology movement and Gandhi's ideas about technology are very strong. Not that the movement has added much to his original ideas... perhaps he was even more radical in his views. He wanted, after all, to do away with the foreign technology that existed in



India, and really go back to a pre-European technology, but in spite of the fact that the Indians are great admirers of Gandhi they have not actually followed any of his specific proposals.

**Reports:** Ghandi also said: "Production for the masses, not mass production." Does appropriate technology reflect that concern for the poor?

**Rybczynski:** Appropriate technology is primarily a product of the United States, Great Britain, and some of the European countries, and then not even a product of poor people in those countries. It comes out of the university and government environment, which hardly represents the poor. I think it has tried to address itself to the problems of poverty, and in certain cases, tried to develop technologies appropriate to the situation of poor elements in society. But it is very rare that appropriate technology has emerged out of poverty.

It's really very much of a top-down movement, which is, I think, one of the reasons why appropriate technology has had limited impact. It always has a built-in philosophical problem, always flowing from developed countries to the Third World, which is a contradiction, of course. Windmills, for instance, were never used by poor people. A windmill in Holland or France was a mark of prosperity.

It's true there is a section of the appropriate technology movement... sometimes referred to as village technology or rural technology... that tries to revive or improve on indigenous practices, particularly in developing countries. I think I would have perhaps the most sympathy for that part of the movement, because in a way it is a modest part, it makes the most modest claims, and it simply tries to improve what already exists. In effect, the original idea of intermediate technology was a technology that stood between the very crude and the very advanced. That still makes a lot of sense.

**Reports:** Do the poor not have to use appropriate technologies simply be-

cause they have no other choice?

**Rybczynski:** I don't see why you have to call it appropriate technology. I think they just use what's at hand. It's very often not appropriate at all. A lot of the deforestation that occurs in Somalia is due to the fact the people use thatch for their roofs. It makes a very good roof for the climate and it doesn't cost anything, but it denudes the landscape and you get erosion. The Somali government is trying to find alternatives to the use of thatch.

One always has to look at specific cases. My argument hinges around this: that without looking at the specifics of a situation you cannot define what's appropriate or not. As a consequence, you cannot determine inappropriate-

Photo: Shirley Hallam



Witold Rybczynski

ness either. The poor often use more highly industrialized products — like galvanized tin for roofing. Does that make it inappropriate? I don't think so.

Appropriate technology tries to simplify, and I don't find it a convincing simplification.

**Reports:** You say that foreign aid agencies have become the main purveyors of appropriate technology, and that a lot of it is parachuted into developing countries. Why is that?

**Rybczynski:** I'm not sure. I think there is a centralizing tendency built into appropriate technology. The theory of appropriate technology is very attractive to bureaucrats because it implies that you can choose different sorts of

technologies and get better results. In a nutshell, that could be said to constitute the basic message of appropriate technology. This is attractive to an aid agency because it means instead of building one sort of plant, you build something else. You stick in windmills, you stick in some other technology associated — however tenuously — with appropriate technology, and you are supposed to get a better result. I think the evidence is that is simply not so.

**Reports:** Are there examples of any successful, widely used appropriate technologies?

**Rybczynski:** It depends on how you define it. There is no technology that is changing the world in terms of revolutionizing the sort of development that is taking place. Most technologies are inter-related with other sorts of development. I think to a certain extent the Green Revolution showed that if you rely on technology alone to make all kinds of social and other changes, you can sometimes be in for a rude surprise.

**Reports:** China is generally given as the success story of appropriate technology. How much success has China enjoyed and how much of its experience can be transferred to other countries?

**Rybczynski:** China was a very strong part of the appropriate technology argument, particularly in the 60s and 70s when very little information was coming out of China except propaganda. My feeling is that the Chinese experience precisely shows the terrible things that can happen when you try to approach technology in an ideological way — which is what happened in the decade of the Cultural Revolution and the Great Leap Forward. I think, in fact, China should be a lesson of what can happen, in a negative way, when you try to impose ideology on technology. There are indications that the Chinese have now returned to a much more typical, pragmatic approach.

**Reports:** Does appropriate technology have a future?

**Rybczynski:** In terms of developing countries, no, I don't think so. It seems to me that the countries that are using appropriate technology — in however small a way — and that are ideologically supporting it, are not the countries which have shown in the past that they are going to make any significant headway in terms of economic development. If countries like India, or some of the centralized economies of Africa simply absorb appropriate technology into their economies there is not really going to be much change. But I think appropriate technology has made a contribution in a general sense. It has made people aware of technology and the importance of technological choice in terms of how it affects other aspects of development.

In a very specific sense, what has happened is that appropriate technology has become isolated. Various agencies have created offices of appropriate technology, or appropriate technology groups, and this tends to isolate appropriate technology. Instead of a philosophy affecting a whole range of technological choices, it occupies a very special sort of niche in development. I think this is a great mistake, because if appropriate technology means anything, it means a point of view that should be applied more or less across the board. This doesn't seem to be what's happening. The question that appropriate technology asks is, how we can control technologies? That is a good question... it is the right question. I'm very skeptical of the answer that we have been given so far. □

† Paper heroes: a review of appropriate technology, by Witold Rybczynski, Anchor Press/Doubleday, 1980. (501 Franklin Avenue, Garden City, New York 11530, usa)

‡ Low-cost technology options for sanitation, by Witold Rybczynski, Chongrak Polprasert, and Michael McGarry (IDRC-102e) is available from Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9



*In the conclusion of his article begun last issue, Daniel Vidart lists the winners and the losers in the game of Amazon roulette*



DANIEL VIDART

# PIRATES OF THE JUNGLE

**T**he destruction of the Amazon basin and its ecosystems can be traced to Latin America's economic dependence upon the industrialized world. Both the haves — transnational companies, private consortiums, and even some public agencies — and the have-nots — those who seek to colonize the jungle — are converging on the Amazon in a frantic scramble to exploit the resources of its various ecosystems: the first, to make themselves even richer; the second, to carve a living from the jungle.

Foreign businesses, generally operating with the government's approval, often seek permission for one type of operation and then engage in another. Like pirates on the high seas, they do as they please in the vast jungle. Here, however, the results are highly destructive.

For their part, the so-called "spontaneous colonizers" are being manipulated for the profit of small- and medium-sized entrepreneurs.

In *The Observer* of 22 April 1979, Norman Lewis revealed that the Brazilian Government had adopted a policy of deforestation of a large area of the Amazon Jungle, aimed at earning the \$US. 42 billion needed to repay its foreign debt. Under this policy, two projects would be undertaken: the creation

of a series of 12 logging areas, resulting in the destruction of 35 million hectares, and another in which the devastation would spread over some 165 million hectares.

Images transmitted by the Landsat satellite show that the forest cover has already been cleared from large tracts in an area equal to the size of the Netherlands (33 800 km<sup>2</sup>). Concerned about this devastation of native forests, Mr Lewis points to the very suggestive findings of a legislative investigating committee that, in early 1979, studied the Jari operation run by an American multimillionaire. At that time, the Jari project had already destroyed 100 000 hectares of virgin Amazon forest to make way for rice and pine tree plantations. The deforestation process has been going on for the last 60 years, and has already seen the demise of one-quarter of the Amazon jungle. The rate of destruction is accelerating and, what is worse, has now become exponential.

## WHY THE AMAZON IS DESTROYED

The forest cover in the Amazon basin is being removed for a variety of reasons. First are lumber exports, particularly hardwood. Hardwood species make up 90 percent of the tropical rain forest (*Hylea*), and as the industrialized

countries of the North use up their own forests (setting apart those which remain for conservation), wood exports from Third World countries inevitably rise. According to Norman Myers (see *Reports* Vol. 10 no. 1), the developed countries imported 4.2 million cubic meters of tropical hardwoods in 1950. By 1973 this figure had risen to 53.3 million, and by the year 2000 it is estimated that it will reach 95 million — if there are any forests left. Earnings from these exports, which in the Third World countries go only to the privileged few, totaled over \$US. 3 billion in 1974.

On 29 September 1974, Camilio Viana, the President of the Society for the Preservation of the National and Cultural Resources of the Amazon, stated that the logging companies are "contributing to the growing rate at which the Amazon forest is being destroyed" and are failing to comply with government regulations regarding the mounting of reforestation programs in cleared areas.

Sometimes land is cleared of native forest in order to plant fast-growing exotic species which produce marketable lumber in very short time.

At the same time, the rise in petroleum prices has led some oil companies to seek methods of using wood as an alternative source of energy. This represents a two-fold threat to the tropical



forest. On the one hand, species which required thousands of years of evolution to reach ecological balance are being thoughtlessly destroyed. And on the other hand, reforestation experiments and processing plants are springing up in areas that have been cleared, further endangering the native forest by industrial pollution.

Cattle raising also takes a serious toll. The wealthy countries of the North are accustomed to a diet rich in animal protein. One method of supplying this is to plant cleared areas with pastures. Myers notes that during the 1960s beef production in Central America rose by almost 100 percent while local consumption remained the same. The increase was largely due to forest clearance. The same situation prevails in the Brazilian Amazon.

The tropical jungle has always been subject to slash-and-burn farming techniques as practiced by native Indians. But now other methods, including both traditional subsistence farming and commercial operations, are practiced where once virgin forests stood.

In the first case, small farmers who have been crowded out of other areas are attempting to use upland farming methods that are totally maladapted to the Amazon ecosystem. These are the peasant farmers of the Ecuadorian *hualasipungos* and the highlands of Peru, the *terraleros* of Narino (Colombia), and the *peguajeros* of Bolivia.

Commercial farming operations are clearing large areas to generate and supply profitable new markets. In both cases, the forest is being relentlessly and permanently destroyed in order to plant crops which, after only a few seasons, rapidly transform the meagre topsoil into useless swampland.

So-called "directed" colonization is a peculiarly Brazilian phenomenon. The armies of poor peasants who used to be forced to migrate periodically whenever dry spells hit the *sartao*, are now being sent to the Amazon by the State itself. The lure of a land of milk and honey is dangled by government authorities before millions of peasants and coastal dwellers.

According to a well-known Brazilian scientist, the outlook for commercial farming operations in the Amazon basin is good if grasslands (*varzea*) are used, if the soil is well fertilized, if riverbanks and natural meadows are used to raise buffalo, and if fruit trees are maintained in their natural environment. Native agricultural methods would need to be abandoned.

The only thing that has been confirmed to date is that commercial agriculture is economically viable on the grasslands. This has been known for some time, however.

One of the most disturbing contributors to the ecological destruction of the rain forest is the construction of the Trans-Amazon and Amazon-Peripheral Highways.

Until 1960, the Amazon basin held only eight percent of Brazil's population. The military government which came

to power in 1964 decided that it was time to "uncover" the largess of the Amazon and solve Brazil's social and demographic problems by moving people from overcrowded coastal areas and the northeastern dust bowl into the Amazon basin. In order to exploit the riches of the area and bring in the colonists, it was necessary to build highways which would break down the jungle's "wall of resistance to civilization."

First to be built was the 2000 km highway stretching from Brasilia to Belem, one of the principal points at which the Amazon reaches the sea. This highway served as the springboard from which some two million colonists were propelled into the interior of the Amazon.

Today, after literally a decade of technological warfare, sacrifice, and much destruction of the natural environment, the Trans-Amazon Highway is complete. This immense fissure, carved from otherwise unbroken jungle, runs from Joao Pessoa and Recife on the Atlantic coast, to the border with Peru, a total of 5300 km. It parallels the Amazon river, some 250 km to the south. Built at a cost of \$US. 500 million, the paved, two lane highway will presumably cost a great deal to maintain.

The Trans-Amazon Highway forms part of a vast network in which some 14 000 km of superhighways and gigantic bridges will criss-cross the area, extending the tentacles of modern life into a world in which man used to live in harmony with the ecosystem.

#### TOMORROW'S VERDICT

Brazilian authorities are confident that the diligent application of new technologies will enable them to repair the ecological damage they have intentionally wreaked upon the delicate jungle environment. But while these restorative technologies are being developed — if, indeed, they are being developed, and if they arrive in time — the Amazon jungle is disappearing. It is being stripped of its riches, and the awesome contribution it makes to the planetary ecosystem is diminishing. The immediate future should reveal whether Brazil has erred or not in its drive to catch up, whether the devastation of the environment was necessary to "pave the way" for progress, or whether it will set in motion even more serious crises as natural resources are used up and ecosystems destroyed.

Make no mistake, this is a serious and deadly challenge, a sort of Amazon roulette that Brazil hopes to win despite the fact that all indications point to failure. The next two decades will provide answers to these questions. Perhaps by then it will be too late to save the ecosystems we are destroying. □

*Daniel Vidart is an occasional consultant for Unesco, a professor with the National University of Colombia, and author of several books, pamphlets, and scientific articles on the environment, development, ecology, anthropology, geography, and history.*

## AVOIDING THE PITFALLS

In the 1970s, Sao Felix do Xingu, an isolated community at the juncture of the Xingu and Fresco rivers in the Brazilian Amazon, underwent several changes as a result of the general colonization of the area. Numerous migrant families came into town in search of land. Interest grew in exploiting the area's rich mineral, soil, and forest resources. Feasibility studies were carried out for official and private colonization projects.

But the biggest changes are yet to come. A road linking Sao Felix to the frontier area in the south of the State of Para will soon be completed. Hundreds of new migrant families and many large-scale agricultural, industrial, and commercial enterprises are expected to follow.

A study, supported by IDRC in 1978, collected baseline data on the social, economic, and political changes resulting from the influx of settlers and investments into this representative Amazon community.

According to the Centre for Regional Planning and Development (CEDEPLAR), which carried out the study, Sao Felix's already-strained capacity will be severely tried as the town attempts to cope with the expected influx of new settlers. Local officials are already concerned about how to provide the necessary jobs and services.

The findings take on greater meaning when viewed as part of a larger process of frontier expansion, particularly as government policies are continuously evolving with the rapid occupation of the Amazon. For this reason, CEDEPLAR is now beginning a second phase of the study to analyze the changes that have occurred in the past three years in relation to policies. The project will look into such areas as changes in land occupation, agricultural production, and economic activities; migration and other demographic patterns; socioeconomic conditions; and the impact of recent changes in government policies.

The results of this study should provide useful information for evaluating the concrete impact of development programs in the Amazon region. It should thus assist in the formulation of government plans, policy evaluations, and forecasts, and may help to avoid the pitfalls that have confronted similar frontier expansion schemes in Brazil as elsewhere in the world.



## NEW RELEASES

# MAKING SCIENCE PUBLISHING FLOURISH

*The appetite for information in the People's Republic of China is being fed by three major science publishing houses, now reaching out across the world*

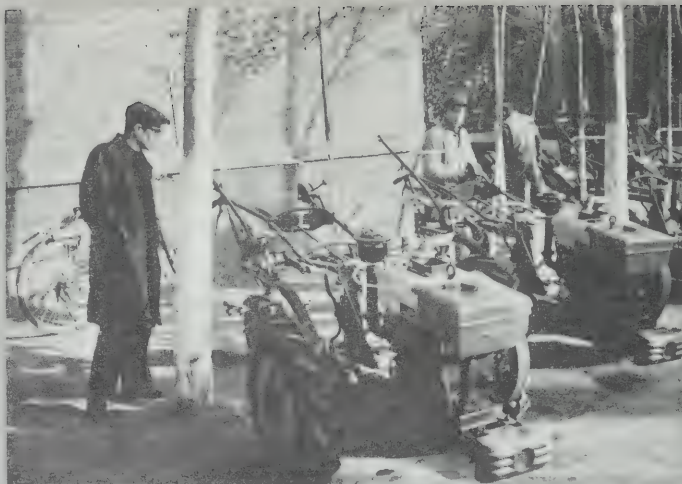
The People's Republic of China (PRC) has an appetite for information. Stimulated by an ambitious development program, the craving for knowledge is almost insatiable. A visit to a Beijing bookstore, crowded even on a sunny spring afternoon, confirms the hunger for books — particularly publications on language and science.

Science and technology are target areas of the PRC's "four modernizations" program. The National Plan for the Development of Science 1978-85 includes among its goals building a nationwide scientific and technological program, matched by a large increase in the number of scientists. Scientific and technical publishers are fully

involved in meeting these needs.

The China Popular Science Press, under the direction of the China Scientific and Technological Association, has as its main task "to make science flourish and to raise the scientific level of the nation", according to Mr Chen Yunshan, deputy director and first editor-in-chief. Established in 1956, the press was forced to cease operations during the cultural revolution. But since being "rehabilitated" in 1978, it has edited and published more than 200 books and magazines.

As its name implies, Popular Science Press is in charge of science popularization: most of its books and magazines are inten-



*The curiosity and appetite for things technological in China is enormous — books and magazines feed it.*

ded for primary and middle school students, and cover a wide range of topics in pure and applied science and technology. Study aids, translations of selected science fiction and other foreign science works, biographies, and reference materials, as well as a great number of science magazines for children and the general public, find their way into every corner of China.

A "sister unit" of Popular Science Press is Science Press, which comes under the direction of the Chinese Academy of Science. The largest publishing house in China, Science Press publishes some 500 monographs and 72 journals annually, as well as proceedings of academic symposia and research reports. They have recently started translating and publishing works by foreign authors as well.

Science Press is authorized by the Chinese government to export its books, journals, and other publications directly to other countries. Mr. Huang Ji-Wu, vice editor-in-chief, says that they are not satisfied with the present level of distribution — some 5000 copies — of their English works. Mr. Huang would like to expand this distribution through new subscriptions or exchanges.

A major source of dissemination of foreign literature is the Institute for Scientific and Technical Information of China (ISTIC). ISTIC's major tasks are to collect science and technology materials at home and abroad, including audio-visual materials, pat-

ents literature and standards materials, research reports and documents, and to make them available through national information publications.

ISTIC's functions include indexing, abstracting, and translating scientific publications. The Institute's policy is to stress document availability, and it is currently operating a current awareness list backed up with journal circulation and photocopy services, a microfiche service, and patent searches.

To carry out its mandate, ISTIC maintains publication exchanges with 62 countries, more than 70 international organizations, and 2500 research institutions.

Some 400 Chinese journals are provided, among the best produced by the various research institutions of the Academy of Science, universities, and learned societies. While most are in Chinese, a few are in English. Others contain English abstracts or tables of contents. ISTIC is now trying to convince all editors to publish English abstracts in order to expand its exchange program.

For further information about subscriptions or exchanges, please write: Science Press  
137 Chaoyangmennei Street,  
Beijing, 100700,  
People's Republic of China

Division of International Relations and Cooperation,  
Institute for Scientific and Technical Information of China,  
P.O. Box 640,  
Beijing,  
People's Republic of China



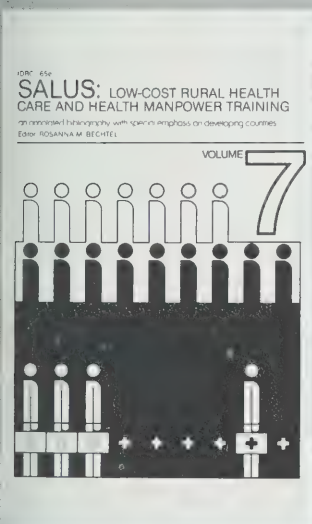
*Schoolgirls near Canton: popular science publishing provides access to materials on science and technology.*



# Techniques de reboisement dans les zones subdésertiques

**d'Afrique, Guy R. Ferlin.**  
Published in July 1981, 48 pages, IDRC-169f.

A guide to reforestation techniques for very dry (subdesert) regions in Africa, this French-language publication outlines the environmental characteristics, objectives of reforestation programs, and tree species commonly used or of potential use in such areas. Chapters on reforestation techniques and dune fixation are included. A special chapter discusses experience with "gum belts" — *Acacia senegal* plantations.



**The future of pastoral peoples: research priorities for the 1980s: proceedings of a conference held in Nairobi, Kenya 4-8 August 1980, John G. Galaty, Dan Aronson, Philip Carl Salzman, and Amy Chouinard, editors.** Published in July 1981, IDRC-175e.

This publication brings together conference papers presented by social scientists, representatives of research institutes, and development planners and administrators addressing problems of pastoral

peoples. How programs and policies designed to aid pastoral peoples in developing countries can be "enhanced by social scientific knowledge and perspectives" is investigated. A discussion summary, research recommendations, and list of participants are included.

## SALUS: low-cost rural health care and manpower training: an annotated bibliography with special emphasis on developing countries, volume 7,

**Rosanna M. Bechtel, editor.** Published in June 1981, 142 pages, IDRC-165e.

This is the seventh volume of a series of bibliographies that compiles and coordinates information, both published and unpublished, on nontraditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and utilization of health workers.

## Induced fish breeding in Southeast Asia: report of a workshop held in Singapore, 25-28 November 1980,

**F. Brian Davy and Amy Chouinard, editors.** Published in July 1981, IDRC-178e.

This workshop brought together representatives from Southeast Asian countries to report on techniques used in inducing breeding of important fish species of the region. The publication summarizes discussion sessions on gonadal maturation, gamete preservation, induced spawning, and larval rearing. A list of participants, and recommendations for research priorities are included as is a microfiche of country reports.

## A decade of learning — Agriculture, Food and Nutrition Sciences: the first ten years. Published in August 1981, IDRC-170e.

This publication reviews the projects and programs of IDRC's Agriculture, Food and Nutrition Sciences Division during its first ten years of operations. The history, philosophy, and style of the division are presented along with an examination of activities in each of the principal developing regions, a summation of experience, and an outline of future directions.

## Wildlife disease research and economic development: proceedings of a workshop held in Kabete, Kenya, 8 and 9 September 1980, Lars Karstad, Barry Nestel, and Michael Graham, editors.

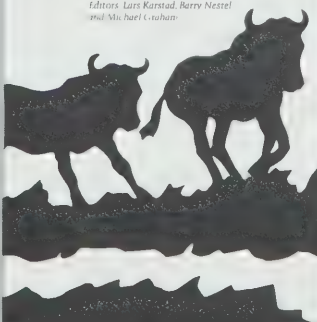
Published in July 1981, IDRC-179e.

This report seeks to focus attention on the complementary role that domesticated and wild animals can play in terms of land use and economic development, and to stimulate interest in research into wildlife diseases. Papers examine the role of wildlife in the transmission and control of diseases affecting livestock production: a discussion of wildlife ranching is included.

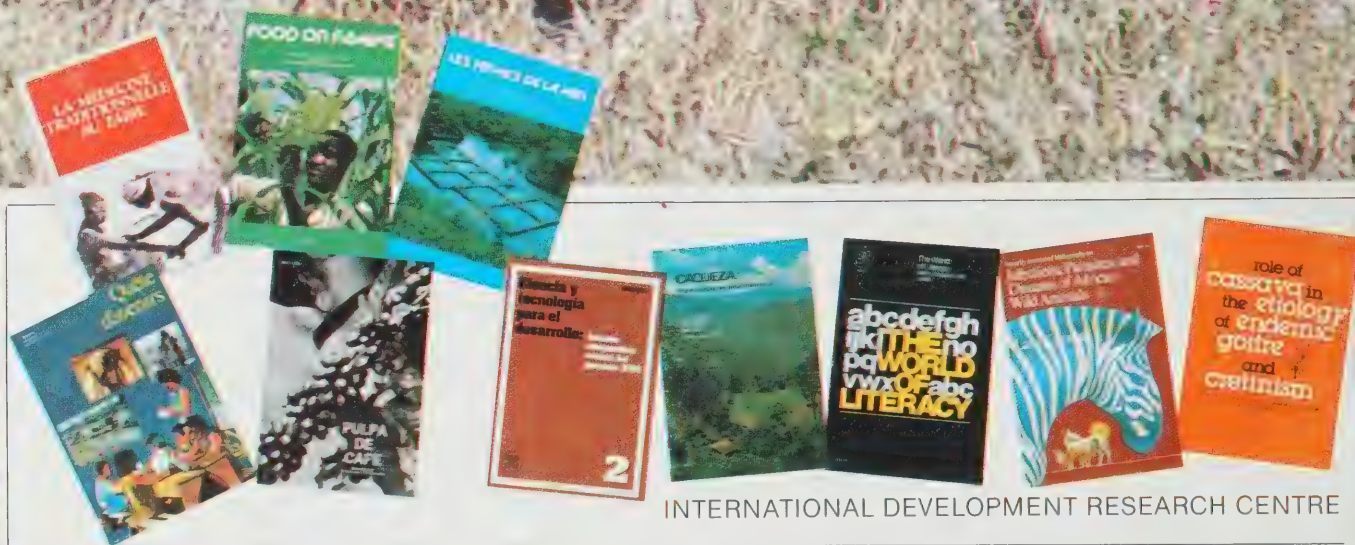
## Wildlife Disease Research and Economic Development

*Proceedings of a workshop held in Kabete, Kenya, 8 and 9 September 1980*

*Editors: Lars Karstad, Barry Nestel  
and Michael Graham*







INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



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activities. A catalogue of currently available material is available on request.

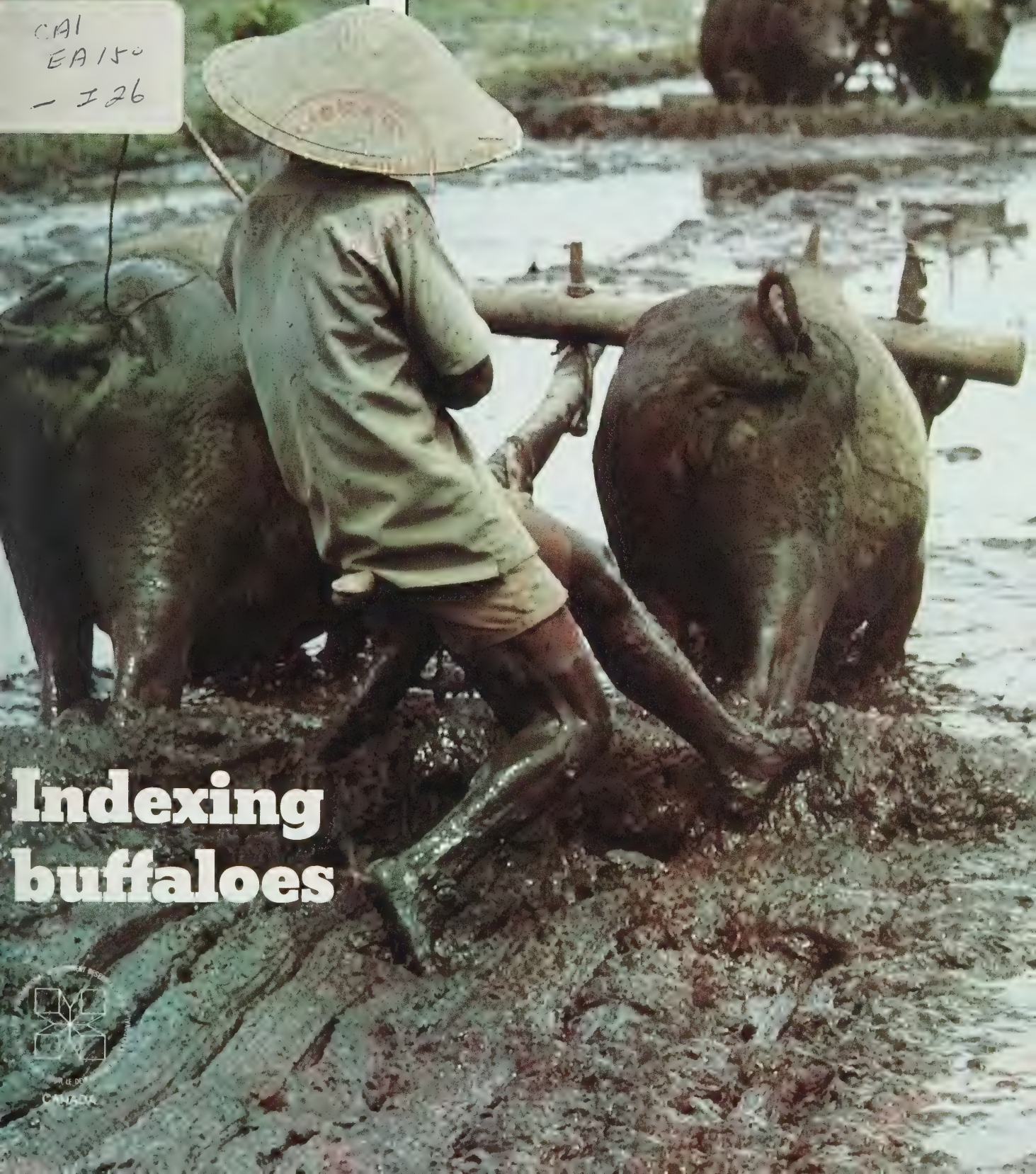
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# Reports

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## Indexing buffaloes





# LETTERS

## More on migrants

I read with interest your article "Exodus of skills" (*Reports*, April 1981), which makes an attempt to balance gains and losses to countries of origin.

One area of discussion underplayed in the article concerns the political and social dimensions of migration. Studies of high-level migration from Latin America, for instance, show that migration correlates with changes in political circumstances and with waves of repression. An Argentine study showed about an 18-month lag following the advent of military governments.

My own work on the "brain drain" has led me to the conclusion that a high percentage of international migration is related to minority status. For instance, high-level migration from Latin America is disproportionately Jewish. In the 1970s that migration represented a second generation migration by sons and daughters of Jewish immigrants

displaced from Europe in the '30s and '40s.

My study of non-return among Peruvian students in the United States (*Education and emigration*, R.G. Myers. David McKay and Co., Inc., New York, 1972) showed that among non-returnees a very high number belonged to a racial or religious minority. I suggest, therefore, that you should add political and social development questions to your conclusion.

You do not, I think, give adequate credit where credit is due. The rate of non-return among foreigners trained abroad with support from funding agencies has not been high, and the benefits to the countries of origin have been considerable. That point could have been made in conjunction with the "returning home" grants. In general, return migration is understudied and, I suspect, undervalued.

Robert G. Myers  
Ford Foundation  
Bogota, Colombia

## Bananas to breadfruit

I have read your article "Banana: fruit or vegetable?" (*Reports*, January 1981) and wonder if you would be interested in looking into the work being done on an equally useful tropical food: the breadfruit.

Such work is being done by Miss E.M. Swaby, Research Officer and Nutritionist at the Scientific Research Council in Kingston, Jamaica, and is of a nature and quality that probably could be very useful in developing countries where this food is a staple of the local diet.

Breadfruit is even less known outside of the tropical countries than the banana, because, although such a standard part of the "poor man's" diet, it is not an export. (Good thing it isn't, then it might become a luxury item the poor could not afford!)

The attempts to help people improve their use of this food nutritionally and in a variety of forms are documented in *Breadfruit for economy*, published by

the Scientific Research Council, P.O. Box 350, Kingston 6, Jamaica. Perhaps such an attempt could be more widely publicized and so be of use to countries beyond Jamaica.

S.E. Wilson  
College of Education  
Brock University  
St Catharines, Canada

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports,  
P.O. Box 8500, Ottawa  
Canada K1G 3H9*





# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *EI CIIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feterbaum. *Staff photographer*: Neill McKee

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**Cover:** Near Malang, East Java, Indonesia. Water buffalo are the tractors of Asia — and also the source of milk, meat, and a host of products. Rising energy costs have brought about a revaluation of the buffalo and spurred new research into the nature of the beast. See story page 12.

**Back cover:** Applying insecticide with bare hands in Senegal. Developing countries are often unknowing victims of an economic system that permits the uncontrolled export of dangerous pesticides. See story page 4.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 30677, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogotá D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 E1 Messaha St., Dokki-Giza, Cairo, Egypt).

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## POISONS

ROWAN

**I**n 1971, leptophos, a nerve toxin pesticide, killed an unknown number of farmers in Egypt, caused many more to become ill, and destroyed over 1000 water buffalo.

In Sri Lanka, the number of deaths from pesticide poisoning in 1977 exceeded those from malaria, tetanus, diphtheria, whooping cough, and polio combined — 938 pesticide deaths, compared to 646 as the result of these diseases.

The World Health Organization's Expert Committee on Insecticides estimates that about 500 000 people are poisoned each year from pesticides, and although not all poisonings result in death, most produce needless suffering and disability.

Among the developing nations, the poisoning rate is alarmingly high. Victims are most often the rural poor who work the land. Inexperience in handling modern chemicals and a lack of instructions and safety warnings in local or understandable language make farming a hazardous occupation.

But the risks involved in pesticide use are dangerously compounded by an economic system that permits products banned or severely restricted in industrialized countries to be exported to developing countries.

An FAO survey revealed that half the pesticides used in developing countries were generally persistent organochlorine compounds, such as DDT and aldrin. DDT was banned in most industrialized countries because its persistence in a stable form in soil and water led to it being concentrated in the food chain, and ultimately in the fatty tissues of humans at the end of the chain. The presence of DDT in a still biologically active form in humans raised fears of

slow poisoning: DDT damaged the central nervous system, heart, liver, and kidneys in experimental animals.

"The banning of DDT in most of the developed nations created a change in the availability of this product in the less developed countries," explains Samuel Gitonga, chief agriculturalist of the National Irrigation Board in Kenya. "In the short run, the supply of DDT tended to increase and the price tended to fall. This made the product far more competitive than it had previously been, particularly compared with other, safer pesticides."

"The traditional rationale for *laissez-faire* in the export trade is that each sovereign nation is free to make its own judgments about safety and environmental risks and to regulate imported products accordingly," points out Jacob Scherr, lawyer for the Natural Resources Defense Council in the U.S.A. "In practice, the system is primed for abuse. As is true of other technologies, the use of chemicals has spread much more quickly throughout the developing world than has the capability to assure their safe use.

"Even where there are product control laws, many developing countries lack the technical capability to monitor imports and control dangerous goods. Lacking such constraints, highly competitive manufacturers of drugs, pesticides, and other hazardous goods resort to deceptive, hard-sell promotions and the corruption of officials.

"By permitting the uncontrolled exports of hazardous products, the U.S.A. and other industrialized nations have displayed an attitude of 'malign neglect'," says Scherr.

The extent of "malign neglect" by the U.S.A. is such that 25 percent of pesticide

exports are products that are banned, severely restricted, or have never been registered for domestic use. Many of these have not been independently evaluated for their impact on human health or the environment, while others are known to cause cancer, birth defects, and nerve damage. Legislation in the U.S.A. governing pesticides explicitly states that banned or unregistered products are legal for export.

But the U.S.A. is only one of the major exporters of pesticides. And following adoption in 1979 of a regulation that requires exporters to inform foreign buyers of the known dangers of banned pesticides, it may very well be the country that most conscientiously regulates against hazardous exports. Many other countries do not. Newly industrialized countries with growing pesticide industries are particularly eager to export their products, but many of them have only minimal controls.

Even the most conscientious of regulations can be useless. The recent revelation of falsified testing results on the part of a U.S. toxicological laboratory charged with pesticide safety evaluations for the American and Canadian governments has meant that some 200 chemicals now in use in these countries could, in fact, be extremely dangerous. Developing countries that rely on Canadian and U.S. testing are even more vulnerable.

Multinational chemical corporations can also simply avoid regulations by shipping the separate chemical ingredients of a banned pesticide to a developing country and manufacturing it there in "formulation" plants. Once constituted and perhaps renamed, the pesticide can be re-exported.

"Safety is never an absolute. It is not





# FOR EXPORT

SHIRKIE

an absence of hazard. Safety is an acceptable level of hazard," says Frederick Rarig, an official of Rohm and Haas Company, a multinational pesticide manufacturer. People refuse to starve simply because there are risks connected with the poisoning of insects, he adds.

"In the course of our investigation," counter David Weir and Mark Schapiro, staff writers at the Center for Investigative Reporting in the U.S.A who set out to document the transgressions of the pesticide industry, "we came to a startling conclusion: over half, and in some countries up to 70 percent, of the pesticides used in underdeveloped countries are applied to crops destined for export to consumers in Europe, Japan, and the United States. The poor and hungry may labour in the fields, exposed daily to pesticide poisoning, but they do not get to eat the crop protected by pesticides."

In their book, *Circle of poison*<sup>†</sup>, Weir and Schapiro point out that it is the export crops that absorb the bulk of the pesticides. Cotton production in El Salvador claims 20 percent of all the parathion used in the world. Banned herbicides like 2,4,5-T and suspect ones like 2,4-D are also used to help clear huge amounts of forest in Latin America, in aid of livestock production that ends up as cheap hamburgers outside the region.

"The subsistence farmers who grow basic food crops are just too poor to buy pesticides. They are pretty much outside the commercial circuit that operates in developing countries," agrees Roger Benjamin, engineer and agronomist in the Canadian International Development Agency's natural resources division, responsible for managing the

agency's plant protection projects. "If they use pesticides, it is because they have been given them as part of some government program . . . they have no choice. What the poorer food producers end up with are the crude broad-spectrum pesticides that are aggravating problems two- and three-fold by killing off natural predators."

Predatory insects are often exterminated through pesticide applications. With their natural enemies gone, the plant-eating pests are able to multiply rapidly, leading to severe pest outbreaks. Farmers respond by applying more pesticides, further reducing the chance for predators to reestablish themselves. And the constant chemical attack puts an evolutionary pressure on pests so that only those with some immunity can survive and reproduce. According to the FAO, the number of pesticide-resistant insect species doubled in the 12 years from 1965 to 1977.

*Circle of poison* reveals another insidious boomerang effect of pesticide dumping — the return of dangerous chemical residues in imported food. U.S. authorities have found that 10 percent of food imports are contaminated with illegal levels of pesticides. Pesticides may also return in other ways. For example, atmospheric transport of DDT compounds applied in countries outside North America continues to pollute the continent's Great Lakes system long after DDT use was restricted domestically.

If governments have been slow to recognize the problems of pesticide dumping, they have been even slower to act. In the U.S.A., an executive order creating a tighter hazard notification system and placing certain especially dangerous substances on a "commodity control list" was signed by the

*Photos: The use of chemicals has spread quickly in the Third World, but not the capability to ensure their safe use. Farmers like these in Sri Lanka and Colombia (right and left) risk pesticide poisoning while safety precautions are taken at a Senegalese research station (centre).*

Carter administration, but overturned by the new President early this year.

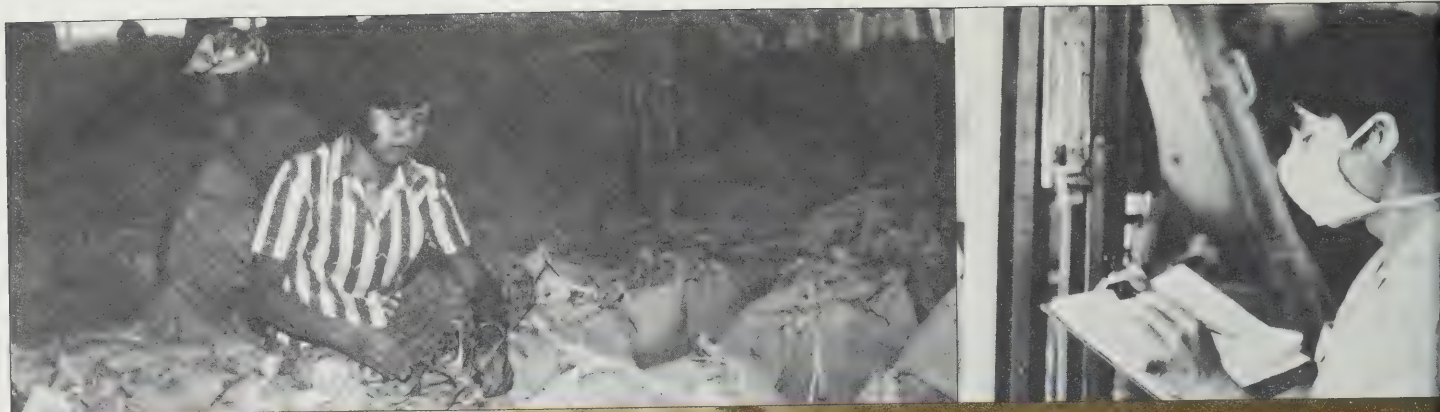
The Organization for Economic Cooperation and Development (OECD) countries have only recently adopted protocols for testing new and potentially toxic chemicals, and set guidelines for good laboratory practices, exchange of confidential information between governments, and the adoption of minimum premarketing data on new chemicals. Canada's environment minister, John Roberts, hopes that the result of the new OECD approach to toxic substances will be a sort of "chemical passport that will precede the export of these chemicals from one country to another . . ."

Regulation may be a way of attempting to maintain control over a dangerous practice. But eliminating, or drastically reducing, the use of pesticides is an alternative that may offer a safer and perhaps even more effective means of control.

"But it will be a long time before you will be able to replace pesticides — impossible, perhaps, to ever eliminate them," says Roger Benjamin. "In emergencies, when you have a massive attack of crop pests or disease-carrying insects, you need to use a strong chemical weapon to knock them down quickly. But like a weapon too, sometimes chemicals are turned on their users." □

<sup>†</sup>*Circle of poison*, D. Weir and M. Schapiro. Published by IFDP, 2588 Mission Street, San Francisco, CA 94110 U.S.A.





*As industrialization spreads in Thailand, so do occupational diseases*

## THE HIGH COST OF WORKING

MICHELLE HIBLER

**D**uring the month of January 1981, the staff doctor of a wet-cell battery manufacturing company located close to Bangkok, Thailand, treated 303 respiratory complaints, 117 eye, ear, nose, and throat infections, 71 gastrointestinal disorders, and 32 cases of skin irritations. Six of the company's 400 workers were hospitalized for lead poisoning.

And yet this firm boasts better-than-average working conditions. There is a full-time physician and a small dispen-

sary. Accidents are few. As there are no quotas to be met, the pace is relaxed and workers can take frequent breaks in a small garden.

The drive to increased productivity in many other enterprises can result in even higher rates of illness and numerous accidents. In 1977, for example, more than 7000 metropolitan Bangkok workers were hospitalized for work-related injuries, a 20-fold increase since 1960. An estimated additional 20 to 30 percent of work injuries went unreported.

No statistics are available on occupational diseases resulting from long-term exposure to noise, dusts, and hot working places or to various toxic chemicals and physical hazards.

According to Dr Malinee Wongpanich, chairperson of the Department of Occupational Health of Mahidol University's School of Public Health, in Bangkok, insufficient attention is paid to the health and safety of workers. The inadequacy of labour legislation, combined with an acute shortage of qualified





*Photos: Thai workers, like this young woman in a dusty bagging plant (top right), are exposed to unhealthy working conditions. Air samples (centre) revealed excessive dust levels in the industries studied and inadequate safety precautions. In the battery manufacture, the face masks are not sufficient to prevent lead poisoning (top left), while steel workers pouring molten ore (bottom) are often without gloves, masks, or eye protectors.*

factory nurses, or — more often — first-aid attendants, many of whom are untrained. In a few instances, says Dr Malinee, recommendations on working conditions are made by institutes such as the Occupational Health Centre of the Ministry of Health, but improvements are left to the factories' discretion. Many factory managers are completely ignorant of the few safety standards set by government.

More than 1000 factories are located in Samutprakarn Province, on the outskirts of Bangkok, employing some 64 000 workers, 80 percent of whom are in textile, fabricated metal products, and chemical industries. According to Dr Malinee, working conditions in these factories often resemble those in Europe during the industrial revolution in the 1800s. Living conditions are also inadequate: many workers, 90 percent of whom are migrants to the area, live in crowded, dirty dormitories, often directly above the shop floor. As the rapid industrialization of Thailand continues, conditions are expected to worsen if present trends continue.

Because scientific research in this area has been so scarce, no data exists to convince policymakers of the need for action. Thus, in 1979, Mahidol University launched a study of 600 textiles workers in Samutprakarn Province to gather the needed industrial health statistics and identify specific occupational health problems.

The study showed that many workers suffered from partial hearing losses due to high noise levels, respiratory diseases, skin rashes, eye irritations, and nasal inflammations associated with cotton dust, as well as general fatigue and gastroenteric diseases due to poor hygiene in factories and dormitories.

The findings proved the need to set up a local industrial health unit in Samutprakarn Provincial Hospital, which was then planning an expansion of its facilities. The unit will be the first of its kind in Thailand.

Following the initial study of textile enterprises, the Department of Occupational Health launched a larger study to compile industrial health statistics and identify problems specific to various industries. Headed by Dr Malinee and supported by IDRC, the project also aims to train and evaluate industrial health personnel at all levels, and develop a model for industrial health services coordinating the various agencies involved — the provincial hospital, medical and labour offices, and the Occupational Health Centre of the Ministry of Health.

The Department of Occupational Health of Mahidol University is the only institute in Thailand providing university-level training for industrial hygienists and physicians. It also provides courses for students in the Master of Public Health program as well as short courses for managerial and other industrial staff, and offers technical support to various government bodies.

Through interviews, working environment assessments, and physical examinations of workers in three factories representative of medium-sized enterprises in each of the three main industrial areas, a picture was obtained of worker health and occupational hazards.

Dr Malinee's worst suspicions were confirmed. In the foundry, for example, accidents are common: strains from carrying heavy loads; burns from molten ore; eye damage from exposure to ultraviolet and infrared radiation and flying chips of metal. Lung and respiratory system damage results from exposure to carbon and iron oxide dust, and to toxic and irritating gases. Dermatitis is common.

The study showed that 69 percent of workers have abnormal pulmonary function and hearing impairments, and 54 percent, visual abnormalities. In addition, a high manganese content was found in blood and urine samples.

The foundry manager wants to solve these problems, but help is hard to find, he says. Different experts have given him conflicting information about the toxicity of chemicals. Physicians are not available for the pre-employment physical examinations. More than anything, though, he wants to know how to motivate the workers toward safety. "We have spent money on safety devices," he says, "but the workers won't wear them."

In fact, in the dark, noisy smelting section of the foundry, a number of workers are not wearing the dust masks or hard hats provided. Some guide the 20-tonne bucket of molten ore with wooden sticks and remove the just-poured ingots without gloves. Scrap metal litters the floor. Because of the intense heat in the stretching section where red-hot metal is made into wire by spinning round a belt, workers have removed their shirts, increasing the possibility of burns. The sole dust collector is out of order.

Similarly, in the wet-cell battery plant, workers grinding lead into powder are not wearing the gauze face masks provided — inadequate for the job in any case. Others are mixing acid without gloves.

Workers in the textile mill are further endangered because of shift work. Statistics have shown accidents to be more frequent during the night shift when the illumination is poor and supervision is more lax. Health problems of textile workers include stomatitis, allergic dermatitis and eczema, and varicose veins caused by standing for long periods at the machines. Visual abnormalities were found in 26 percent of workers and hearing losses in 49 per-

personnel to enforce the regulations, has contributed to the neglect of health and safety in the workplace, she says. Trained medical personnel are in short supply and modern instruments are not available. Not the least of contributing factors is the workers' ignorance of safety precautions.

Thailand's industrial health activities are limited to pre-employment physical examinations, annual chest X-rays, and curative medical care. These services are administered by part-time physicians,



cent, particularly those in the weaving section. The noise and dust levels were above legal limits, while lighting was below standards.

In March 1981, Dr Malinee and her team were revisiting the factories to inform managers about the training course being offered for first-aid attendants, ask for nominees, and get their input into course content. Courses were also planned for physicians from the factories, the provincial hospital, and private practitioners, as well as for nurses and industrial hygienists. By testing the trainees after their return to work, the impact of the courses will be evaluated.

And because Dr Malinee strongly believes that the drive to increased productivity will continue to exact a heavy toll on workers' lives and health unless factory owners and managers are thoroughly educated, meetings with senior management will be held to increase their awareness of health and safety problems and solutions.

Together with resource persons, representatives of different provincial and national agencies will then draw up a feasible basic model of provincial industrial health services — the first attempt in Thailand to coordinate existing institutions and services at the provincial level.

Interest is already growing. In the factories studied, simply identifying the problems has helped bring about improvements. The foundry manager wants access to the training materials and audiovisual aids developed in the course of the project for use in teaching factory workers. The plant supervisor wants further studies of chemical toxicity problems. "I have a right to my life," he says.

*The industrial health study in Thailand was the first such project supported by IDRC. A second IDRC-supported study, by the Singapore-based Asian Association of Occupational Health, will review occupational health conditions in several Asian countries.*

## PLAYING IT SAFE

Thirty years ago, silicosis, heat-stroke, occupational poisoning, and skin diseases were widespread in the People's Republic of China. Today, according to Dr Li Shiyu of the Health Research Institute of the Chinese Academy of Medical Sciences, all have been greatly reduced or virtually eliminated.

China's policy is "prevention first". Since the 1950s, the Chinese government has allocated funds for the prevention and treatment of occupational diseases, and scarce materials, such as steel, for producing protective equipment. State industrial and labor departments set safety standards for factories and mines. Safety measures and improvements in working conditions are also included by factories in their yearly production schedules.

Most of China's 29 administrative units — provinces, municipalities, and autonomous regions — have one or more industrial hygiene and occupational disease research institutes as well as special hospitals, sanatoria, and rest centres for workers. In addition, medical centres have been established in large manufacturing firms, says Dr Li. Treatment is generally based on a combination of Western and traditional Chinese medicines.

One of the research institutes, the Beijing Industrial Hygiene and Occupational Disease Research Institute, is staffed by 98 researchers and doctors. Researcher Dr Lu Yongyan says that since the institute was founded in 1962, progress has been made in checking silicosis, the most harmful and "incurable" occupational disease. A lung disease, silicosis results from the inhalation of fine silicon particles.

The Institute's researchers recently carried out physical examinations of factory workers in constant contact with toxic materials such as mercury, benzene, chromium, and their derivatives, to determine the incidence of industrial poisoning. Small,

poorly equipped factories operated by rural communes were found to be the main sources of infection. As a result, labour protection specialists are now working in the factories to eradicate the sources of poisoning.

Like the Beijing Institute, other occupational research institutes in China often send their researchers to factories and mines to investigate conditions. These professionals also teach workers how to protect themselves against dust, heat, poisoning, and other causes of illness.

The Health Research Institute of the Chinese Academy of Medical Science and other leading research centres regularly sponsor classes to train labour protection personnel and medical staff in industrial and mining enterprises and in communes. All medical colleges have departments of occupational health, says Dr Li.

As a result of investigations conducted in cooperation with technical innovators, industrial hygiene and occupational disease research institutes have designed a variety of effective safety devices appropriate to conditions in

China. They include dust testers and removers, radiometers, and instruments for reducing heat, acid, and noise.

Extensive research has been carried out in the areas of lead, mercury, and benzene poisoning. In chemical plants, technicians and workers are looking for new processes to replace the poisonous content of paint spray solvents. In modern plants producing lead, trinitrotoluene, and other toxic materials, air-tight equipment, remote-control, and mechanized or automated operations are in use.

Particular attention has been paid to the prevention of poisoning in rural areas. At one time poisoning cases increased because of the rise in the use of chemical fertilizers and pesticides and lack of knowledge about their hazards among the farmers. Medical workers now frequently visit rural communes to teach methods of safe application of these chemicals. Rural doctors have been trained to treat these illnesses and safety devices have been designed for the farmers' use. As a result, says Dr Li, acute poisoning cases are now rare and chronic poisoning has been reduced.

Rice growers face different risks. The larvae of parasitic cone snails hatching in flooded paddyfields penetrate the skin, causing an itching inflammation. By adopting deep ploughing methods or applying insecticides, the cone snails and their larvae can be eradicated. Chinese protection specialists have also designed special paddyfield socks to prevent this dermatitis.

As part of the current economic readjustment plan, China has been improving working conditions in mines and factories. The installation of dust, poison, and pollution control devices is now required in all new industrial sites. The Ministry of Metallurgical Industry, for example, plans to spend 20 percent of its capital construction budget for such devices.

Wang Pei



Chinese workers convalesce at the seaside.



## IS ANYONE LISTENING?

Following the massive inhalation of dust laden with quartz and granite, some South African miners died of silicosis within 35 days. Must workers die for occupational diseases to be recognized in Africa? So it would appear. Apart from a few studies cited here and there, it seems that work-related diseases do not exist in Africa.

"I know there must be some," says Ousmane Ba, work inspector and technical advisor to Senegal's Ministry of Public Service, Employment, and Labour. "Because we don't have any specialists in industrial diseases, we rarely have any cases. This is primarily due to the lack of experts who could identify the origin of illnesses."

Even if the greatest part of their workers are employed in the rural sector, African countries are nevertheless on the way to industrialization. Mines and quarries are often one of the first modern industries to be developed. It is also in these industries that pneumoniosis is most common. A lung disease caused by the inhalation of irritant particles, it is the world's most widespread occupational disease. But precise figures are hard to come by. Except for the Sudan, Tunisia, and Nigeria, few countries have studied the problem.

The Sudan has identified cases of lead poisoning and, in the south-east of the country, symptoms associated with respiratory illnesses have been reported in workers at the Ingassama chrome mine. Air samples revealed excessively high levels of dust in the drilling and loading sections. Based on these studies, carried out in 1978, IDRC supported a more detailed examination. The results are not yet available.

Elsewhere, miners seem free of pneumoniosis, mainly because open-pit mining prevails. Open to the skies, the mines are well aired and the continuous infiltration of water keeps dust levels down. This is the case in Nigeria's Enugu coal mines.

The same situation is found in Senegal's phosphate mines at Taiba, but Dr Idrissa Pouye, physician at the Senegalese Social Security Bank — the organization that pays compensation to victims of work accidents — states that he has seen silicosis and chronic bronchitis in Taiba's miners. And Dr Birane Diouf writes in his thesis on occupational medicine, professional diseases, and work accidents in Senegal — the only such study in the country — that: "In general, the most common complaints are contact dermatitis in cement and oil plant workers, and

bronchial ailments in phosphate workers."

One of Dr Pouye's colleagues at the Bank, Dr Badara Diouf, insists that he has never seen any cases of pneumoniosis or silicosis. The occupational diseases that file through his office are most often those affecting crews of fishing vessels. Most common are felons, severe inflammations of the finger tips resulting from wounds caused by fish scales. Next are cases of gastroenteritis, food poisoning, and food allergies, because "the food is improperly kept on shipboard." Then come cases of dermatitis in cement and fertilizer plant workers, masons, and mechanics.

Senegalese doctors agree that dermatitis is the most widespread occupational disease. Workers are often faced with a dilemma: if they do not wear gloves and boots, they sustain injuries. But wearing gloves and boots, most often made of rubber, is unbearable in the high heat and humidity and can lead to dermatitis.

Oddly enough, even though the Social Security Bank physicians treat occupational diseases, not a single case is recorded in the Bank's accident prevention service, "owners settle informally with the workers — either the company's physician treats the victims, or they are sent to the hospital. We're never informed." Birane Diouf states in his thesis that "the scarcity of occupational diseases in Senegal is simply due to the fact that the most common, contact dermatitis in cement and oil workers, is not entitled to compensation because it doesn't figure on the official list of occupational diseases."

Statistics are even scarcer on occupational diseases in rural areas where up to 80 percent of the population is employed. All the physicians agree on the danger faced by farmers who handle pesticides without protection and then often eat without washing their hands. "Unfortunately," says Ousmane Ba, "we don't have any specialists who can identify the role of pesticides in accidents."

In the Ivory Coast, where most plantation workers are temporary migrants from Upper Volta, a new occupational disease has arisen. Spurred by production incentives, workers drug themselves in order to work longer hours. They are often so highly drugged that the government of Upper Volta has opened a rehabilitation centre where they are treated on their return home.

Work inspection services are also inadequate in most African countries. Often they don't have any vehicles or monitoring devices, and their role is limited to trying to clean up after serious accidents have occurred.

According to Thierno Danfa, accident prevention and occupational health services in the countries he knows are at their embryonic stage.

Only Mali, where all factories have their own health and safety committee, escapes his criticism. "There, everyone is sensitized," he says. "Even if they are illiterate, workers know how to make suggestions for improving working conditions." But is anyone listening? □

*Jean-Marc Fleury*



*Africa is on its way to industrialization, but health services have not kept pace.*



## Flower power

The production of an environmentally safe but highly effective pesticide will bring much-needed employment and foreign exchange earnings to Rwanda, one of Africa's least developed and most densely populated countries.

The recent opening of a \$3.5 million refinery to extract pyrethrum from flowers in the country's northern highlands is expected to provide jobs for more than 20 000 people.

Pyrethrum is the source of a family of pesticides that are far more effective than DDT, but which have a low toxicity for humans, other mammals, or plants, and which degrade safely and rapidly once exposed to sunlight and air.

Pyrethrum flowers must be harvested at full bloom to obtain the highest concentration of the insecticidal extract. The operation is therefore labour-intensive and well suited to Rwanda's employment needs.

Production is presently controlled by a local agricultural cooperative, of which many members were formerly landless peasants. With a government plot allocation of 0.3 hectares each, and working under the supervision of rural extension officers, yields have been nearly doubled. More than 8000 families are now engaged in production. In time, subsidiary product industries are expected to evolve to produce sprays, mosquito coils, etc., providing additional income and jobs.

## Housing innovations

A unique house design that combines strength, flexibility, low cost, and simplicity has been developed by two

Canadian architecture professors.

Called RHOMBI by its designers, Professors James Strutt and Gulzar Haider of Carleton University's School of Architecture (Ottawa, Canada), the building is a departure from square, cubic constructions. It uses fewer members and supports than traditional designs, and employs a very simple type of joint. A single steel column supports an angular fibre-cement configuration topped by a flyroof (a secondary roof that deflects the sun's heat and provides ventilation). Vented ceilings and a louvre system control air movement through the house, making it suitable for tropical conditions.

According to its developers, RHOMBI is inexpensive, easily and quickly assembled, and is rot-, mildew-, and rodent-proof. The units can be adapted for structures of one to three stories, or one to four bedrooms, and the design allows for a high housing density — 44 to 72 dwellings per hectare — while maintaining privacy.

The Venezuelan government has expressed interest in acquiring 7000 RHOMBIS, but the designers wish to study the units' economics and cultural impact before they are used in concentrated housing developments.

## Fever strikes

News reports from Africa claim that "people are dying in hundreds" from a virulent new strain of Rift Valley Fever, a disease that only killed animals until six years ago.

The disease, which causes blindness, internal and external bleeding, and death, is reported to have moved through equatorial Africa as far north as Egypt

and is threatening the Middle East.

Although veterinarians and farmers have occasionally contracted the disease, no human deaths were recorded before 1975. Like malaria, Rift Valley Fever is a viral disease transmitted by mosquitoes. But it can also be spread through direct contact with an infected animal or simply through the air.

At least 600 people died in a 1977 outbreak in Egypt. The disease was first identified in animals in the Rift Valley of Kenya in 1911. Virologists believe that it may occur in a cyclical pattern, with periods of retreat into the African forests where wild animals — tolerant to its attack — may act as living reservoirs of infection. New strains emerge then to attack animal and human populations that lack natural resistance.

## Delicious dumping

A highly polluting organic waste from Brazil's gasohol program could become a bonus for the country's fishing industry.

By 1985, Brazil expects to be producing 10.7 billion litres of alcohol fuel annually. But for every litre of fuel alcohol produced, 13 litres of distilling slurry or swill are left over. When this swill is dumped into rivers — as it reportedly has been, illegally — its decomposition absorbs an enormous quantity of oxygen. As a result, fish and other aquatic life die of oxygen starvation.

But when the swill reaches larger bodies of water, such as the ocean, scientists have noted a sharp rise in the numbers of fish and plankton. Researchers from Rio de Janeiro's Industrial Technology Foundation are

investigating the possibilities of piping distillery slurry to the coast for selective dumping.

Brazil has an extensive coastline and a fledgling fishery industry. The lack of nutrient-rich upwelling currents in the coastal waters, however, keep fish stocks low. Recycling the organic slurry may turn an environmental problem into a food bonus. (*World Environment Report*)

## Less food for more

During the next few decades there will be an "unprecedented growth" in the world demand for food resulting from income growth in Third World countries, increased per capita consumption in the centrally planned economies, and little or no decline in demand in the developed countries, according to a recent statement by John W. Mellor, director of the Washington-based International Food Policy Research Institute (IFPRI).

Mellor notes that such growth of demand among the comparatively well-off will "reduce the availability of food to the countries with the most laggard development and to the poor in all countries".

Increasing demand for livestock commodities in the Third World and the move to build livestock herds in the Soviet Union are important factors in the future grain picture. A large increase in grain imports in the People's Republic of China will add to the squeeze on food supplies. But, according to Mellor, the demand for food imports will be strongest in the major oil-exporting Third World countries.

Although food intake will gradually improve in many Third World countries, "the rising real price of food will



continually squeeze the poor, and increased fluctuations of food supplies and prices will exert extreme pressure on them in some years.

"The appropriate development strategy for the coming decades will be to emphasize agricultural production more than ever before," says Mellor, "to utilize the resulting increase in farm income to stimulate other sectors, and thereby to increase employment, the incomes of low-income families, and hence their effective demand for food."

### Barbara Ward

Barbara Ward, journalist, economist, humanitarian, one of the most eloquent voices calling for global justice, died May 31 at her home in southern England.

A member of IDRC's inaugural Board of Governors, Barbara Ward was the author of more than a dozen major works on economic development. She served on United Nations and Vatican commissions dealing with the sharing of world resources, and exerted a profound influence on the debate surrounding the relations of rich and poor nations.

Many acknowledge an inspirational debt to Barbara Ward. She was a prime motivator of the new direction taken by development assistance in the mid-1960s, which led to the Pearson Commission and subsequently the creation of IDRC. A successor commission, chaired by Willy Brandt, out of which emerged *North-South: a program for survival*, was also sparked by her idea.

In recent years, she saw that just as the wealthy nations of the North were stingy in their development assistance, they were extravagant in their waste of natural resources. As president of the International Institute for Environment and Development she maintained that peace between rich and poor must be part of peace between humanity and the environment.

*The Economist*, the influential British weekly from which Barbara Ward first launched into world

affairs, called her continuing message, "against all the odds, one of hope."

### Up-dates

Date palms are probably the oldest cultivated fruit trees in the world, going back in history for several thousand years. Although they originated in the Middle East and North Africa, they are now found in many other parts of the world, including the U.S.A., Mexico, Peru, and East Africa.

World date production averages about 1.5 million tonnes annually, but yields are low in the traditional date-growing regions. To solve this problem, a regional date and palm research centre for the Near East and North Africa, known as NENADATES, was established in Baghdad to coordinate efforts to introduce improved date varieties and better techniques of cultivation.

Dates are now entering the computer age with the establishment at NENADATES of a date and palms information centre. IDRC, which has helped establish similar specialized information centres in other fields, will provide training and advice for the project staff, and technical assistance in implementing the service.

### Winning roots

An IDRC-supported root crop program in the Philippines has won a national award for "outstanding achievements in the form of significant contributions to the welfare and well being" of Filipinos and "the advancement of agriculture and resource research."

The 1980 Tanglaw Award (*tanglaw* means light: a spiritual, cultural, or intellectual enlightenment) was given to the Philippine Root Crop Research and Training Center (PRCRTC) at the Visayas State College of Agriculture. Presented by the Philippine Council for Agriculture and Resources Research, the award is intended to focus public attention and confer national recognition on achievement "to serve as inspirational examples and ... powerful incentives for other members of the national research community."

A 4-year grant from IDRC in 1976 enabled PRCRTC to undertake a research, demonstration, and training program in root crops — principally cassava, sweet potato, and taro. PRCRTC has established what is possibly the largest pool of root crop germplasm in Asia — more than 3000 accessions. The Philippine centre has also been identified as the lead agency in the areas of use, variety testing, and storage in an international network to develop the sweet potato industry.

### Sure shots

Up to a quarter of the 40 million children vaccinated against measles this year will actually have no protection because the vaccine they will get will be "dead" — destroyed by heat or sunlight.

The problem of deteriorating medicines is especially acute in developing countries, where refrigerated storage may not be available. In fact, the World Health Organization has called the difficulties of keeping vaccines safe and effective "the greatest stumbling blocks to successful immunization." Until recently, there has been no adequate way for rural health workers to tell whether a vaccine is still potent.

IDRC has now joined with American and British agencies to test a simple time-temperature indicator that can signal when a vaccine should be discarded.

The indicator, a tiny adhesive tab that can be attached to the glass vaccine vial, undergoes a sharp change in colour when exposed to heat long enough to have inactivated the vaccine to which it is attached. The principle is similar to children's fever-strip thermometers now popular in Canada.

### Go bananas

Banana beer, anyone? How about banana noodles, bread, or chips?

Developing new and better food products using bananas is a way of cutting down on waste while improving diets and incomes for people in Central America. As much as 15 percent of the

region's crop is rejected by large exporters because it does not meet the quality standards demanded by foreign consumers of fresh fruit.

Small growers do not have the resources to process their bananas before they spoil, so both the income and food value of downgraded fruit are lost. But, with IDRC help, scientists in Costa Rica, Colombia, Guatemala, Honduras, and Panama are working on ways to turn that loss around.

They are trying to develop a rural industry that can use the rejected bananas in a variety of products, and stimulate a local outlet for producers and a new food source for consumers. Banana puree, cake, cookies, cereal mixes, chips, cubes, juice — and yes, beer — are just some of the variations.

### The new seafood

A lowly vegetable plankton could help solve the world food problem. That, at least, is the claim of a California (U.S.A.) firm now marketing spirulina.

The blue-green plankton is found in highly alkaline waters around the world and, in fact, has been eaten for centuries. But only recently has it been reevaluated as a food source. Chemical analysis of spirulina by United Nations laboratories have apparently shown that it contains 65 to 71 protein and all essential amino acids as well as a range of vitamins, including all B vitamins and vitamin A.

Bonny Venture Service (P.O. Box 5289, Ventura, Ca. 93003 U.S.A.) suggests that spirulina could fit into eating patterns anywhere, either eaten on its own in the form of tablets or incorporated into traditional dishes. It has a fresh vegetable taste, needs no cooking, and does not spoil with age. Ten kilograms of spirulina would be sufficient to meet an average person's nutritional needs for a year.

Spirulina is a basic link in the food chain and feeds large numbers of birds in Lake Nakuru in Kenya as well as fish in Lake Chad. It could be grown extensively in aquaculture installations says Bonny Venture Service.



# WATER BUFFALOES

## 150 MILLION STRONG

*Long neglected, Asia's "living tractor" is now attracting much scientific interest*

MICHELLE HIBLER

**E**very Monday and Friday morning, in Chiang Mai, Thailand, the water buffaloes come to town. Amid the bellows of both beasts and owners, deals are struck and animals change hands. This is the water buffalo market, a busy place as farmers, spurred by soaring fuel costs, abandon motor-driven tillers in favour of the four-legged kind.

For more than 4000 years the water buffalo (*Bubalus bubalis*) has pulled ploughs through the rice fields of Asia, transported heavy loads, powered machinery of all kinds — from threshers to water pumps — and provided a host of products. In fact, all parts of the animal can be used, from its intimidating horns for buttons, utensils, and other implements, to the hair in its ears for surgical and other brushes.

Nor is the water buffalo confined to Asia. From its home in India, where half of the world's 150 million water buffaloes can be found, it has spread to 38 countries, including Australia, the Caribbean, Florida (U.S.A.), Italy, Mozambique, Tanzania, and the U.S.S.R. During the past 25 years, the world buffalo population has increased by almost 90 percent.

The popularity of water buffaloes can be attributed at least in part to their even temperament. Despite their formidable appearance, they are easily domesticated and trained. Throughout

Asia, in fact, they are usually cared for by children. Hardy, they adapt well to different conditions and resist infection, particularly insect-borne diseases, better than other ruminants. They are also long-lived — up to 80 years — with a useful life of about 20 years.

Water buffaloes thrive on vegetation not otherwise needed by man and seem to convert it into meat and milk more efficiently than other cattle. Buffaloes are the main milk producers in six countries — China, India, Nepal, Pakistan, the Philippines, and Thailand. The milk has a high fat content and is richer in protein, lactose, and milk solids than cows' milk.

The buffaloes' most important service is undoubtedly in the fields. Their wide, flattened hooves enable them to pull a plough through muddy rice paddies where oxen get bogged down. In Thailand, they work five hours a day on average, for up to 146 days a year. In China, one buffalo has been found sufficient to do all the work on 2.3 hectares of cultivated land.

The main source of traction in rural Asia, buffaloes can pull more than their weight. They are also used for riding, and as pack animals in remote rural areas.

The water buffaloes' greatest potential, however, is as a meat producer. Animals reared for meat are usually slaughtered at about 18 months and

dress out to about 50 percent live-weight. The meat is often undistinguishable from beef. As the demand for meat rises in protein-poor developing countries, buffalo rearing could contribute greatly to food supplies.

Water buffaloes do have a few drawbacks, however. Slow to mature, they only breed seasonally. It has proved difficult to improve stocks through artificial insemination. Their hide, while thick and widely used in the leather industry, is almost hairless. They therefore have difficulty in controlling their body temperature and are unprotected from insect bites. Thus, they need a good wallow in a muddy river each day.

Although the water buffalo has long been the animal of small farmers and is often their main capital asset after the farmhouse, to many it has been a symbol of resistance to progress. According to a 1979 report of the U.S. Agency for International Cooperation (AID), the water buffalo was ignored by scientists, despised by most agricultural advisors, and considered an embarrassment by government officials trying to modernize their countries.

Only recently have these attitudes changed and scientists begun to devote attention to the water buffalo. Some countries have now developed advanced capabilities in some key production areas. In 1976, the importance of the buffalo to much of the developing world was recognized by the Technical Advisory Group of the Consultative Group on International Agricultural Research (CGIAR), and in 1978, eight Asian countries agreed to share their research, setting aside some \$3 million to support this collaborative effort.

Buffalo research is hindered, however, by a lack of information. Although the literature on this animal has grown in the past two decades, and several countries have independently attempted to improve the situation by the production of bibliographies, the work has been uncoordinated, involved duplication, and relied heavily on published documents from industrialized countries which did not pick up much information generated in the developing world.

The need for a research and information network was recognized at a number of international meetings and Thailand was finally chosen to be the coordinating centre of the research network because of a strong national program with a National Buffalo Research and Development Centre. It was therefore



*A water buffalo in the Philippines — once and future king of Asia's rice fields.*



decided to establish the information centre there as well.

The International Buffalo Information Centre (IBIC), as it is called, will be located at Kasetsart University, Bangkok, not only because it is the lead institution in the Thai program, but also because of Kasetsart's library resources

and experience with the operation of other information activities such as AGRIS, the International Information System for Agricultural Sciences and Technology.

A clearinghouse for world literature on the buffalo, the centre will collect documents, particularly non-conven-

tional literature, and analyze and disseminate the information (see interview this page). It should benefit all countries seeking to introduce the water buffalo as a mainstay of their agricultural development programs. It promises a long and prosperous future for Chiang Mai's buffalo market. □

## DOCUMENTING THE BUFFALO

Ms Daruna Somboonkun, Librarian at Kasetsart University, and Dr Charan Chantalakha, of the Department of Animal Science, were interviewed for *Reports* by Mr Vivat Pratheepchaikul of the *Bangkok Post*.

**Reports:** Could you give us a brief history of the International Buffalo Information Centre and explain why it is needed?

**Charan:** As you might know, there are approximately 150 million water buffaloes in different countries of the world. Some 95 percent are in Asia. Two types of buffalo are of economic importance: the river buffalo is the milking type, found mainly in India, Pakistan, and the Middle East; the other is the swamp buffalo, concentrated in Southeast Asia and China.

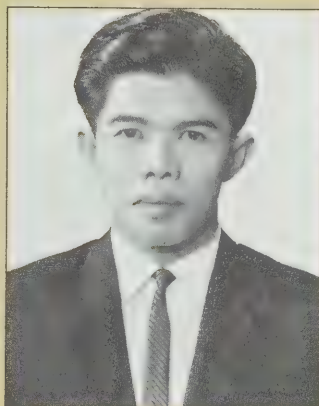
In the past, water buffaloes have been neglected by scientists except for work done in India, Egypt, and Pakistan on the river buffalo. Since 1970, however, many scientists in different Asian countries have become interested in the swamp buffalo because these animals are very important. For example, 95 percent of rice production in Thailand depends on the use of buffaloes and cattle in the fields, and although some mechanization has been adopted in some areas, most rain-fed agriculture still depends on the buffalo.

So far, no single organization has been set up to collect and distribute research and extension information on this animal. In the last decade, much research has been done in different countries and published in the local languages, so it is not available to researchers in other countries. Even within the country, the information is not well disseminated. As a result, much of the research funding is probably spent on seeking information that has already been obtained. So it is economically very important to set up an information centre to collect and disseminate the information to research and extension workers in different countries.

**Daruna:** One of our objectives is to gather information — from all over the world if possible — and, secondly, to disseminate the information —



Ms Daruna Somboonkun



Dr Charan Chantalakha

ranging from basic to the advanced — to researchers and all types of users throughout the world, in any language.

To start the project, we received financial assistance from IDRC for the first three years of operation. IDRC has sent Dr Leatherdale, who is on secondment from IDRC to FAO, to work on a thesaurus for the buffalo project. With this thesaurus we hope to provide a good service to users and we will be able to retrieve information from external data bases as well.

**Reports:** What are the functions of the information centre?

**Daruna:** First of all, we have to collect documents and articles on the buffalo from world sources and then analyze them. These will then be indexed and abstracted, and a microfiche will be made of the original document so it is readily available to everyone.

**Charan:** The indirect function will be the creation of regular communication or linkages among researchers.

**Reports:** How is the centre being set up?

**Daruna:** The organization of the information centre will be somewhat similar to that of other specialized information analysis centres in that we are going to provide a key to the literature on the buffalo. We are also going to publish a newsletter to use as a means of communication between institutes in different countries.

**Charan:** I would like to add that in different countries, such as Indonesia, the Philippines, Malaysia, and so on, there are also institutions interested in buffalo research that have at least a small collection of research information. Through these institutions we will obtain information for our centre. The Philippines, for example, have set up a national buffalo research and development centre.

According to the five-year plan, they will spend some \$5 million for buffalo research, so they will have a small unit to collect information. We will contact them and obtain their information for our centre.

**Reports:** Who can use the centre?

**Daruna:** Anyone can use it.

**Charan:** It will be very useful. For example, if extension workers want to know how to feed rice straw to buffaloes to make maximum use of the rice

crop they can obtain information from our centre on what should be added to the straw to make the buffalo grow best.

Anyone who is interested in buffalo production can use the information.

**Reports:** What are the prospects for the buffalo information centre?

**Daruna:** We hope that with the establishment of our centre, all types of information will flow more rapidly and regularly between users. For example, there may be an agricultural scientist in Thailand working on the same topic as a scientist in China. The inventory of on-going buffalo research which will be published will help solve this problem of duplication.

**Charan:** As a user of the buffalo information, I think that through the linkages — through the information exchange — the centre will not only facilitate the flow of information, but will promote cooperation among researchers in different countries. At present, many scientists in different countries are very interested in solving the problem of buffalo reproduction to increase the reproductive rate of the buffalo. The exchange of information is now based on personal communication. When we have the information centre, then the formal exchange of information will be quite efficient so we will know exactly who is doing what, and what they are getting from their work. This would then probably promote future communication among these people, so the centre will not only act in an information-gathering and dissemination capacity, but it should induce future cooperation as well.

As a result, we expect a great improvement in research capabilities.



# RURAL SQUATTERS

## CAUGHT IN THE LABOUR TRAP

NEILL McKEE AND MICHELLE HIBLER



Squatter settlements, long a problem in the cities of the Third World, are springing up on rocky hillsides and old roadbeds in Chile's rural areas. Many of these *aldeas*, or new villages, appear to be permanent. Others move with the harvests.

The inhabitants of Chile's *aldeas* are, and always have been, farmers. But they are landless, or jobless, or both.

At the root of this phenomenon are Chile's economic policies with respect to agricultural development. Between 1965 and 1973, Chile's economic strategies emphasized increased government intervention and control in the form of price controls, subsidized credit and inputs, interest rate controls, and trade restrictions. This was also a period of land reform when some 6000 large estates were expropriated.

Since 1973, however, the military government has removed restrictions, subsidies, and controls in a shift of policy to free market operation of the agricultural as well as other sectors of the economy. The land reform program also changed: a third of the expropriated land was returned to the original owners, another third was parcelled out to some 40 000 families, and the remainder was auctioned off.

This sequence of land reforms sounded the death knell of the former *hacienda* system of land tenure. Under this feudalistic system, large landowners employed many families to work the land and assumed responsibility — social, economic, and political — for "their" peasants. But a highly capitalistic form of agriculture, on smaller farms, and a new political regime, has removed the advantages of keeping large numbers of dependent workers. The peasants have therefore been thrown off the farms.

Whereas in most countries these dispossessed would swell the ranks of the squatters in the cities, they have not done so in Chile. Although no census has been taken since 1975, a study of peasant employment, migration, and production, conducted by the Agrarian Research Group of *La Academia de Humanismo Cristiano*, indicates that the urban population has remained stable.

The main reason is the lack of employment opportunities in the cities, particularly in industries. Due to the removal of trade restrictions, local products cannot compete with cheap imports. Unemployment is officially at 12 percent, but a further 6-8 percent of the

urban population work only through a program of minimum employment, doing menial tasks for below-subsistence wages.

Chile's peasants, says Jaime Crispi, the project's director, also want to remain as peasants, to get land in any way they can. But there is little land available.

### THE DISPOSSESSED

In the fertile central zone of the country around Santiago — the north of the agricultural region — there has been an expansion of export-oriented production in large and medium-sized farms, producing mainly fruit. Large capital investments have been poured into these modern mechanized farms, which account for 90 percent of Chile's agricultural yields. Few labourers are needed except during harvest when labour demands jump 10- to 15-fold.

In the south, just before the country breaks up into fjord-indented peninsulas, dairy farming now predominates. This was previously a wheat-growing area, but the removal of subsidies for fertilizer and other inputs, as well as of import restrictions, has made domestic wheat uncompetitive. The dairy farms, like the fruit farms, are capital-intensive



*For Chile's landless peasants, farming means harvesting fruit destined for export. To survive, small farmers must produce and sell more for ever-diminishing returns. They must eventually seek outside work.*



and require few workers. There is little room for small producers.

Between these two regions lies a band of less fertile lands, traditionally given over to crops other than grains in the north and wheat in the south. Little capital has been invested in this region because of poor profit margins. Production fluctuates between various staple crops — potatoes, beans, sugar beets — whatever will bring the highest returns. Here, there is space for small farmers.

The researchers suspected that most of the displaced persons — some 200 000 people — were trying to farm in this area and that this was accompanied by large internal migratory movement. Their suspicions have been confirmed.

The study found that a number of peasants have joined family and friends who own land in this region. Some have found employment on small farms and others have turned to share-cropping, particularly in the south. Still others have become "new villagers".

The growth of the new villages and their economy is now being studied in a second IDRC-supported project launched by the Agrarian Research Group in an effort to recommend ways of alleviating the problems facing their inhabitants.

The region around Temuco, close to

the dairy-farming zone, for example, was a wheat-farming area. The Mapuche Indians have always owned land on reservations in this area. Worked for generations with few inputs, the soil is poor and individual parcels are small. All those who could get out of wheat farming have done so and now cultivate a variety of subsistence crops. There is the danger of farmers selling their land to large-scale forestry plantations being established in the area. Little employment is available on the neighbouring dairy farms and border clashes have brought a halt to migration to Argentina in search of work. For two or three months of the year, the Mapuches trek north to the fruit belt to work in the harvest where they earn a little more than minimum wage. "What is impressive", says Crispi, "is that they feel it is like a gift to be able to do so because it is the only way they can earn any money."

North of this area, below the fruit belt, multiple cropping provides greater employment opportunities. Because the crops ripen at the same time as the fruit, farmers cannot afford to leave their land. While many people have moved to this area in search of employment, the researchers suspect that they

will move on as soon as possible because the economic base in the area is too poor to support them. In fact, while some have found work on farms, many more have been reduced to gathering wild fruit, fishing, and hunting for survival. They will probably swell the ranks of seasonal workers in the fruit belt.

#### NECESSITY OF POVERTY

The IDRC-supported study has shown that Chile's present export-oriented agricultural economy depends on the peasant economy, says Crispi. The supply of seasonal labour, essential to the success of the large fruit farms, is only available as long as there are large numbers of poor desperate for an income.

The impoverishment of the peasants has been documented through the project. Dr Crispi explains that 40 000 small farms were created through land redistribution. Because subsidies and credit are not available, these farmers produce the only things they know how, without any inputs — potatoes, beans, and other staple foods of lower income groups. The resulting increase in the supply of these commodities, combined with a decrease in the poor's buying power, depresses the market price of their products.

The only way farmers can maintain their incomes is by producing and selling more, further depressing the prices. And while this results in a greater availability of common foods, farmers are eventually forced to seek outside work to maintain their incomes, increasing the supply of temporary labour for large farms.

The findings of the peasant employment study and other studies are being disseminated to the numerous, action-oriented, nongovernmental organizations working in Chile's rural areas, such as the Centre for Educational Research and Development (see following article). "For us this is a very important policy," says Crispi, "to see our research translated into action."

The research is recording the history of what is happening in Chile. "This will be very important in the future because we will need to have solutions," he adds. "We are not trying to be provocative, but simply pointing out what is true."



## TEACHING PARENTS TEACHING CHILDREN

NEILL McKEE

The old mansion on Erasmo Escala, in the older part of Santiago, Chile, is a hive of activity. These are the headquarters of CIDE, the Centre for Educational Research and Development, a private institution established in 1974. Today, CIDE carries out a large number of programs throughout the country.

There are three main integrated dimensions to CIDE's activities: research, development, and diffusion. In the words of its director, Patricio Cariola: "We want to be good conceptually, intellectually, and scientifically and at the same time keep our feet very much in the development process of poor groups and *campesinos*, while remaining involved in the whole Chilean education process."

Leaving CIDE headquarters in the sunny Santiago valley, the traveller passes through less fertile lands to emerge in a very different world. Here, 900 kilometers to the South near the city of Osorno, is the site of one of CIDE's preschool education programs.

It rains much of the time in the Osorno region. The land is then transformed into a quagmire, and the peasants huddle in their isolated shacks for some semblance of warmth.

This is a land of little comfort, marked by a history of conflicts—border squabbles with Argentina and class struggle. During President Allende's time in the late 1960s some of the farms were seized by militants trying to accelerate the process of land reform. Reprisals after the coup were swift. The region has been shrouded in a blanket of fear ever since. People began to fight among themselves and disorganization ensued. Unemployment is high, and *chicha*, a crude alcoholic drink made from almost anything, is the release mechanism. But alcoholism is only a symptom of deeper problems.

In an area where the infant death rate is 13.5 percent, one might expect that surviving children would be nurtured and cherished. But the problems are so numerous and the individual plots of land so small that children are often viewed as a debit, not a credit. Communication between children and parents is therefore often lacking, and reserved for the basics of life such as the time to eat and sleep. Misery and the struggle to survive fray tempers.

In such conditions, there is little room for praise or encouragement, little time for teaching or showing affection. The children who make the long

trek over muddy paths to school are often not adequately prepared. The drop-out rate is high. Ignorance and apathy might appear to have a good future in the 10th region of Chile.

The great educator, Paulo Freire, identified apathy as the main enemy of education and development. Armed with the spirit of Freire and experience in another part of Chile, CIDE entered these hills in 1978 to launch a program aimed at parents and children, *Programa Padres e Hijos* (PPH).

For this preschool education program, 35 sets (a total of 660 in all) of worksheets were developed by child psychologists for parents to use in helping children aged 4 to 6 learn at home. They include basics such as learning to write, count, and speak properly, but they also cover broader issues of nutrition, hygiene, sex education, and emotional and social problems such as alcoholism and lack of affection between parents and children.

Instruction manuals for the parents are provided with the worksheets. Each of the worksheets has clearly stated objectives. On one, for example, a cartoon drawing of a father asks a child to compare two saucepans. The text reads: "With these games the child learns to concentrate and to pay attention."

In order to put the program in place, CIDE identified and trained 10 coordinators. Another 100 people, working as volunteer coordinators in various localities, helped to organize the program and enroll parents and children. CIDE estimates that 6000 people were directly involved or affected.

The PPH program is divided into 12 units, each dealing with different topics. For instance, the first is on general child development. Pictures of a well-nourished and a poorly-nourished child, and other representations of poor hygiene or lack of affection are used as conversation starters. The coordinators raise the question of how the family can help the child learn. Gradually, the parents learn to talk of their own situations.

The most important element in this process is group dynamics, according to CIDE researchers. The coordinators only guide the discussion, encouraging people to talk about their own problems and draw conclusions.

In an unimpressive building on a



*Learning at home in Chile using materials developed by the Parents and Children Project: the entire family benefits.*



side street of Osorno is an organization that is perhaps as important as the coordinators. It is "The Voice of the Coast," a one-kilowatt radio station set up by Capuchin missionaries from Holland.

One of the services provided by the station is the Radio School Foundation for rural Development (FREDER). Without FREDER's services, the PPH program would have been much more difficult to implement in the south of Chile. For the last few years, the scattered households on the hills west of Osorno have been united by at least one thing — FREDER.

The Parents and Children Project benefits from its partnership with FREDER in a number of ways. Announcements of project meetings and activities are broadcast, saving the coordinators miles of walking and months of work. FREDER also participates directly in the project by broadcasting radio plays written by people to communicate their conclusions on issues raised by PPH.

Perhaps the most important contribution is the continuity assured by FREDER. Having completed its two-year program in 44 communities, PPH has moved on to new ones, but FREDER remains in the original project area. In fact, one of the criticisms directed at the project has been that the centres should have been called "FREDER centres" rather than "PPH centres".

That criticism and a host of other issues are discussed in a report on the Parents and Children Project by Dr Howard Richards of the University of Indiana and members of CIDE. Richards helped start PPH in Chile in the early '70s and returned to evaluate the program near Osorno in 1980.

Richards sets out in the beginning of his report to tell the reader that the study is not a systematic, cost-benefit evaluation of PPH. Such an evaluation would measure the "efficiency" of the system.

Social scientists who attempt to evaluate PPH using the usual systems approach would first ask for the objectives of the program, and then measure efficiency in terms of cost per desired outcome, he says. However, nowhere in the project documents would they find a clear statement of objectives. By pressing further, "reasonable social scientists", as Richards calls them, might discover some objectives for the program — 660 of them, one on each of the worksheets for the children. If satisfied with these, the social scientist could begin the systematic evaluation by measuring the program inputs. In this way, Richards maintains that the evaluator would eventually find that PPH cost US \$6.83 per month per pre-school child in 1979, whereas the national kindergarten program cost US \$28.15. The differences in achievements between PPH "graduates" and kindergarten students could then be measured on up to 660 scales!

In addition to the problem of getting bogged down in the measurement of so many objectives, Richards maintains that the reasonable social scientist

would be missing what are perhaps the main achievements of the program. These are what he calls the "non-objectives" of PPH: community fundraising; events such as sports tournaments, bazaars, and raffles; and craft activities such as knitting, textile painting, embroidery, making children's clothes, woodworking, and sisal weaving.

In addition, PPH has fostered such activities as making a community first-aid kit, organizing funerals, composing and singing songs and poems, aiding needy neighbours, planning and building a community centre, and repairing a school or chapel. Committees formed to carry out these activities have also begun to take grievances to the authorities — for example, the lack of health clinics in their communities and the broken-down bridges.

How can one measure such "non-objectives"? Through what Richards and others have called the "illuminative approach", a participatory process. First, 10 "informants" were elected from the communities. They travelled to Osorno where they were interviewed extensively. From these interviews, a "verbal image" of the project was drawn. Taken back to community meetings, the image was reviewed by others who confirmed whether or not their communities had participated in the "non-objectives" mentioned above. A final "verbal image" of PPH was thus arrived at.

This method of verifying the verbal image is what social science theorists have called "triangulation". It is adapted from the method of geometric calculation used by surveyors and astronomers. Richards says: "By analogy, we can think of the various pieces of information we can assemble about PPH or some other social reality as 'sightings' that 'determine' whether facts we cannot check directly are true."

When pressed to give more evidence for the peasants' statements about PPH,

he offers more proof by triangulation: direct observation of meetings, teacher's opinions, inspecting completed worksheets, reports of independent observers, content analysis of worksheets, case studies, and specific psychological tests. All of these corroborate the previously established image of PPH.

"The key to determining whether PPH is cost-effective is in the study of attitudes," says Richards in the first few pages of his report. "If attitudes change, it is." He points out that PPH's methodology is "essentially a technique for achieving participation. The attitude change brought about by participation is essentially a new identity or perhaps two new identities — one as a member of a community, another as instructor and friend of one's children."

Did attitudes change? According to the report, there is evidence that alcohol consumption declined in PPH communities. People became more concerned with the welfare of their children and community problems. The objectives set out on the worksheets were achieved, but perhaps it was more important to achieve those generated by the people themselves. If PPH was evaluated for its efficiency alone, these activities might not only be ignored, but the voluntary time taken to achieve the changes in attitudes would be added to the "input" or "cost" side.

There are problems, nevertheless. One has been the inability to integrate PPH into the existing education system. Some of the committees are not allowed, even today, to use the community schools for meetings.

In spite of this, one can sense that something important has happened in the 10th region of Chile. The Parents and Children Project appeared at a time when it was needed. Old values, suppressed but not forgotten, have been revived. Perhaps the fog has lifted a little from the hills west of Osorno. □



*A renewed interest and involvement in community life were main achievements of the program.*



# FROM IDEAS TO ACTION

## SCIENCE JOURNALISM IN WEST AFRICA

### *New skills and a new association for francophone writers*

“One doesn't master a technique or become an expert in a new field in only one week of work, no matter how intensive or interesting.” So says Pierre Sormany, President of the Quebec Association of Scientific Communicators, about a workshop on science popularization journalism that he presided over at the *Centre d'études des sciences et techniques de l'information* (CESTI), in Dakar, Senegal. The 17 participating journalists from nine francophone African countries nevertheless came closer to that goal and improved their scientific communication skills.

Media in West Africa deplore not being able to give science and technology the prominence they deserve.

According to Vincent Traore of the *Institut du Sahel*, scientific magazines are almost non-existent and scientific information interests few media.

One of the reasons for this situation is that too few journalists are skilled in science reporting. To help fill the gap, IDRC, financed this first science-writing training seminar for West African francophone journalists last April.

Precise objectives had been set for the six-day seminar. CESTI, the organizer, wanted first of all to enable journalists already involved in science writing to develop their skills and compare experiences with colleagues in other countries. On this point the seminar was an unquestionable success, says Sormany. From the first day, the journalists, most of whom were responsible for science pages of newspapers and magazines or radio and television programs, were freely discussing their experiences and problems. As the seminar progressed, so did the spirit of solidarity among them.

The seminar was also designed to confront the science writers and a number of researchers in such a way



*In a coastal village in Senegal, journalists learn at first-hand about the problems faced by scientists.*

that the content of the articles produced could be made to better reflect scientific realities and the needs of the scientists. The participants were therefore plunged into this activity from the very beginning, starting with a press conference given by Dr Rene Noufy Ndoeye, a Senegalese specialist in the diagnosis of liver ailments. Although far from easy, the subject was doubly interesting as liver cancer is widespread in this region of Africa. Mould on groundnuts, Senegal's main crop, is suspected by some to be one of the causes.

There followed many interviews with scientists and visits to research projects around Dakar — an experimental solar

energy generating plant, a community animation project in an urban squatter settlement, a major agricultural research centre, and a coastal village where fishermen are learning how to harvest shellfish.

When the finished articles were submitted to the scientists' criticisms, they gave rise to lively debates on communication problems between researchers and journalists. A sample of the target audience was also invited to criticize the articles to determine if the message had been well received and understood.

The seminar also aimed to foster a debate on the problems facing scientific communication in the region and the environment in which it is practiced. During a discussion led by Vincent Traore, common needs were identified: the need for journalists to exchange information, the need for a documentation network, the need to convince policymakers that national science activities should be talked about ... and in order to do so, the need for the journalists to speak with a common voice, perhaps through an association of science writers.

According to Pierre Sormany, “the success of this kind of seminar can be

mainly measured by the ideas that it spawns ... and the survival of those ideas.” The International Association of African Science Journalists, created the last day of the seminar, has as its goal the survival of those ideas and attests to the will of the journalists to pursue the dissemination of scientific information in francophone Africa.

—MH □

*A similar seminar for East African science journalists is being planned for Nairobi, early in 1982. For information contact: Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9.*



# MEDIA AND MESSAGES

*Flexibility is the key to development communication in India*

T.E. VOIGT AND RAJIVE JAIN

It is dark at the construction site near New Delhi. The air is heavy with smoke and spices as Rajasthani construction workers cook rice and lentils over open fires in front of tents. Suddenly the headlights of a van pierce the darkness. As the vehicle bumps over the uneven ground, "Lok Doot! Lok Doot!" sounds excitedly into the Indian night.

Lok Doot, a mobile educational theatre unit, is just one of the many groups in India that use theatre as a medium for development communication. Its repertoire includes humorous skits on the value of literacy, hygiene, and balanced nutrition. The material is drawn from the audience's daily life. Thus, "balanced nutrition" means supplementing the staple diet of lentils and rice with green leafy vegetables known to cure night blindness, an ailment common among construction workers.

Lok Doot is financially better off than many other groups. Its parent company, Mobile Creches, was founded 10 years ago by middle-class women to provide day-care and, later, educational facilities for children of New Delhi's predominantly female construction work-

ers. Now they try to educate parents as well as children.

Various such theatre groups operate throughout India, most of them on shoestring budgets. They need few props, no technological training, and can arrange instant feedback or discussions around their performances.

At the other end of the communications scale is videotape recording. But despite its advantages, video is an expensive medium for citizens of a country like India. "If, to trigger a social process, I need 75 000 rupees worth of equipment and two or three highly paid workers, then I am not a social worker," says the director of Chitrabani, a Calcutta-based agency.

Although less expensive, even cassette recorders and slide projectors are costly items in a country where the average annual income is about Rs 1000. A cassette recorder costs at least Rs 800 and even a film projector lightbulb can cost Rs 150 to replace.

Added to the cost of the equipment and staff training is the problem of appropriate audiovisual material. An Indian villager, unused to western art or photographs, may not receive the

intended message of a slide show. One health worker, for example, used slides to show villagers the link between the nearby swamps, the mosquitoes, and malaria. Several villagers reacted strongly to a close-up of a mosquito on the screen. "If we had mosquitoes that size in our village, of course we would worry," they said.

Unicef has found that two-dimensional traditional drawings can be more meaningful to rural populations in Nepal than photographs. Chitrabani is experimenting with hand-drawn slides to allow villagers to abstract messages into pictures more meaningful to them.

Low-cost slide projectors are also being developed. Chitrabani is working with what it calls a Magic Lantern that can be manufactured locally and inexpensively and can function with either a 100-watt lightbulb or a petroleum lamp.

The government of India has long recognized the importance of mass communication. Radio has been considered a tool of national development since India drew up its first Five Year Plan in 1951. Like television — which was introduced in 1957 — All India Radio (AIR) remains state controlled. In 1977, a total of 84 stations and 155 transmitters beamed out 1045 hours of programming a day in 35 languages and 137 dialects. Even so, only about one-third of India's population has access to radio, although almost 70 percent of India's geographical area could potentially be reached.

The Working Group on Autonomy for Radio and Television was critical of India's programming to date, commenting in its final report: "There is little doubt that by opening up new worlds of knowledge and opportunity, broadcasting can be a powerful liberating force. Yet the tragedy is that radio and TV have, with rare exceptions, tended to avoid programs that specifically focus on poverty, exploitation, and social justice, even if these are limited to educating the illiterate and oppressed about their legal and social rights."

In the field of communications, flexibility is particularly important in a country as complex as India where two-thirds of the people are illiterate, and which is divided into 90 distinct ethnolinguistic regions. The purpose of the communication must take precedence over the nature of the medium, for each has something to offer, be it a street play or a national radio program. □



*India's street theatre groups reach often-neglected groups, like these women, but all media have a role to play in spreading the development message.*



## SCIENTISTS: SPECIAL TARGETS FOR GOVERNMENT REPRESSION?

JOSÉ GOLDEMBERG

North American and Latin American scientists, engineers, and medical professionals from 13 countries, meeting in conjunction with the 1981 American Association for the Advancement of Science (AAAS) annual meeting in Toronto (Canada), condemned the violation of human rights of their colleagues currently taking place.

The participants at the meeting, organized by the AAAS Committee on Scientific Freedom and Responsibility, expressed their concern about the decline of academic and scientific freedom in recent years. This, they said, has led to a deterioration in the quality and availability of education at all levels as well as a restricted research environment. Attacks on scientists and students imperil the long range possibilities for national scientific and technological progress and contributes to the brain drain, they noted.

The participants concluded that this attack on human rights and scientific freedom has become a chronic problem. Working groups recommended the promotion of greater cooperative efforts in responding to violations; the establishment of a Latin American regional centre to monitor and support scientific and academic freedom; the monitoring of the granting of loans by lending institutions; and the recognition by funding agencies of the need to support research into the causes of repression and violations of human rights.

They concluded by affirming that the advancement of science is fundamentally linked to the advancement of human rights. Scientists therefore have a responsibility, not only to promote scientific freedom, but also to promote the basic rights guaranteed to all under international law.

The following article is extracted from a paper given by Prof. José Goldemberg, physicist and president of the Brazilian Society for the Progress of Science.

Legend has it that when the Romans captured the Sicilian city of Syracuse in 212 BC, a soldier killed the great mathematician Archimedes as he was trying to solve geometry problems in the sand. This story is often cited as an early example of brutality toward an eminent scientist, brutality that has prevailed throughout history in many parts of the world. In actual fact, Archimedes was working on a combination of mirrors that would set fire to invading Roman ships by concentrating solar energy on them, an activity that obviously qualified him as a "combatant" in the eyes of the victorious army.

This story always comes to mind when I think of the problem of the persecution of scientists and the violations of their human

rights in Latin America.

One has to be realistic enough to recognize that a very strict system of laws and regulations is in effect in many countries, forbidding political activity of one type or another. Scientists who violate these regulations or who involve themselves as citizens in the struggles against governments are bound to be imprisoned and suffer in the hands of the police. These are risks they take as individuals interested in changing or improving things. No special privileges can be claimed for them.

There are, however, a number of activities which are not strictly political and areas of discussion in which scientists are important — the protection of the environment, rational use of land resources,



preventive medicine, protection of minorities, and educational problems in general. Scientists play a large role in these discussions and, as a result of their views, frequently overstep the narrowly drawn limits of tolerated discussion. They are consequently arrested or persecuted.

Contrary to popular belief, military governments and dictatorships are not the result of historical accidents and neither, generally speaking, are they installed by "palace coups". They come about when the upper middle class feels threatened by increasing demands from the population and ever more powerful labour unions trying to obtain a larger share of the national income. As a rule in Latin America, the upper middle class constitutes some 10 percent of the population but earns half the total income. The military is part of the class of techno-bureaucrats that maintains this system. It is an auxiliary of the ruling class and reflects its aspirations.

In critical situations — Brazil in 1964, Chile in 1973, Argentina in 1977 — the domestic political situation resembles civil war. In the "roar of battle" all kinds of reprehensible actions are justified. The most politically active groups suffer, mainly workers, intellectuals, and students. In the process, universities and scientists also suffer.

Yet, in Latin America, scientists are also generally part of the upper middle class, either by birth or by newly acquired importance. In addition, scientists and technologists are considered important to a country's development, and many military and

techno-bureaucrats in government are fascinated by the achievements of technology. In the quest for self-assertion, and in order to fulfill their ambitions of becoming a powerful nation, military regimes have come to realize that technology such as aerospace engineering, communications, and nuclear energy is essential. This means giving special privileges to scientists and engineers.

#### SCIENCE AND POLITICS

Are scientists special targets for repression? It is the significance of the functions scientists perform that attracts attention to their activities. As a result, they receive special honours, but are also persecuted and because they easily become representatives of the aspirations of many people, they are bound to clash with the more repressive groups in society.

The special traits of scientists — a refusal to accept authoritarian rule, a search for evidence, a disdain for myth — are bound to trouble repressive governments that stand for traditional privileges and values.

Current Latin American governments are frequently unclear about their position regarding science and scientists. While some ministers and members of the military value and encourage scientific activities, others do not. A particularly good example occurred in 1977 in Brazil when the government almost succeeded in suppressing the annual meeting of the Brazilian Association for the Progress of Science (SBPC).

In 1961, Brazilian universities were purged of many unacceptable professors, who were forced to

retire. However, the SBPC meetings remained open to them. During the 1970s, the SBPC meetings were the only forum where people could discuss and analyze specific problems and they often resulted in protests, warnings, and denunciations. Slowly, the annual meetings became important political events and tensions among scientists and the government mounted.

Government judgments on the subversiveness of the scientists' activities followed four criteria:

- scientific work in the exact sciences was not considered dangerous to the stability of the government and was actually useful to the technological development of Brazil;
- work in the social sciences, however, could be a threat. Sociological studies of the poverty-stricken areas of Brazil, for example, are in themselves political arguments demonstrating the failure of government policies;
- physicists have become a threat because they have pointed to problems associated with nuclear energy, which interfered with government plans;
- meetings in which scientists and students mix freely might "contaminate" other sectors of society against the government.

The 1977 meeting was "tolerated" only at the last minute. This was a dramatic affair because the vacillations of the government increased the importance of the meeting and because Brazilian scientists, who are usually quite conservative, were outraged at the obscurantist position of the authorities.

In general, governments want a docile population. Scientists are not docile,

and therefore they are a breed to watch with suspicion. In this sense, science and scientists cannot be separated from politics.

#### WHAT CAN BE DONE?

The only sensible policy in my view is to try to convince governments and ruling elites that the persecution of scientists actually runs counter to their own interest. Enlightenment seems to be the only way to protect scientists.

In large countries — such as Brazil, Argentina, and Colombia that have elites with great national projects — this seems possible because in the medium and long term, their projects are hurt by the lack of scientists. In the smaller countries, enlightenment is a much harder task, because it might actually make sense to suppress scientists as well as other more liberal elements of society.

I recommend that all opportunities, public and/or private should be used to stress the importance of science and technology in solving the problems of developing countries. Whenever possible, one should stress that differences of opinion as well as criticism should not be construed as "subversive" or "conspiratorial".

Enlightenment failing, only embarrassment at home and abroad can act as a deterrent to the violation of human rights of scientists. These violations can and should be characterized as "auto-phagy of vital parts" on the part of authoritarian governments, in the sense that they are destroying important parts of their own systems. This method has worked in Brazil and I don't see why it should not work in other places. □





*Venereal diseases jeopardize the future of Africa's youth*

## THE HIDDEN EPIDEMIC

JEAN-MARC FLEURY

**V**enereal diseases are becoming as familiar as the common cold. Some are becoming resistant to antibiotics, and new kinds appear for which there are no remedies. They can cause sterility, particularly in women, kill children in their mothers' wombs, and scar others for life.

The current epidemic of sexually transmitted diseases (STDs) is global, but its consequences are far more serious in under-equipped countries, where ignorance, the lack of systematic methods of identification, and inadequate health services enable these diseases to wreak their damage, unchecked. What is more, the true extent of the venereal disease problem in three-quarters of the world is unknown because of a lack of data. Such was the backdrop against which some 100 specialists from 25 countries met in Dakar, Senegal, last May, to discuss sexually transmitted diseases. This was the second regional conference on STDs to be held on the African continent.

For a time it was believed that antibiotics had eradicated such age-old venereal diseases as gonorrhea (blennorrhagia) and syphilis, but they are more widespread today than ever. Gonorrhea has assumed near-epidemic proportions in the United States, where 3.5 million new cases are diagnosed each

year. In Cameroon, the incidence of gonococcal infections doubled between 1961 and 1967, with 815 cases occurring per 100 000 inhabitants. In Lagos, Nigeria, the popular belief is that a man is not fertile until he has had gonorrhea! In India, syphilis has remained the most prevalent STD while Latin America and the United States are experiencing a resurgence of the disease.

Statistics point to an exponential rise in the incidence of venereal diseases throughout the industrialized world. And while reliable data on the situation in the developing countries is lacking, Dr Alan Meltzer, an IDRC specialist in tropical diseases and public health, agrees with most experts that it is just as serious there, if not more so. Within countries, freer sexual mores contribute to the rapid spread of STDs. Tourism, conferences, and business trips then ensure their transmission throughout the world. The absence of statistics on a country does by no means indicate that it has not been affected.

Thus, in the U.S.A., a country for which comprehensive — and rather startling — data is available, five million people are already known to be carriers of the virus that causes genital herpes, a new STD. The incidence in the Third World of this difficult-to-detect disease is not

known, but Dr Meltzer believes it is very widespread.

Almost three-quarters of the women carrying the Herpes simplex type 2 virus show no symptoms. Four of five children born to carriers will be infected at birth as they pass through the mother's genital tract. Thus, unsuspectingly, increasing numbers of mothers are likely to give birth to a child doomed to die shortly or suffer irreversible eye, liver, and nervous system damage. In 1978, 740 newborns died and 180 suffered irreparable brain damage because of the "love virus." Herpes simplex is also thought to be a contributing factor in cancer of the cervix, making cancer another necessary addition to the list of sexually transmitted diseases.

Other viruses transmitted during sexual intercourse, such as the cytomegalovirus, papilloma virus, and hepatitis B virus, can affect the brain of the unborn child or result in stillbirth. Each year in Great Britain close to 3 000 infants are infected by cytomegalovirus, 500 of whom suffer serious brain damage.

As there are no medicines against viruses, viral STDs cannot be treated with drugs. Thus, the only way of protecting the unborn child of a carrier is to perform a Cesarean section. And even then, the virus, of which there is



no external manifestation in most women, must first be detected.

It goes without saying that viral STDs could have an enormous impact in the Third World. In fact, according to Dr Corintho Santos, director of the Latin American regional office of the International Union Against Venereal Diseases and Treponematoses, developing countries are liable to end up with a young generation of cripples because of STDs.

At the Dakar conference, a physician also announced that researchers in Senegal had identified the bacterium *Chlamydia trachomatis*, the agent of a new STD that has rapidly become the most common venereal disease in the U.S.A. and England. *Chlamydia* multiplies in the female genital tract. If untreated, this bacteria inevitably results in salpingitis, an infection of the uterine (Fallopian) tubes that can eventually cause sterility. The bacteria is also very likely to infect the eyes or throat of babies born to carriers. More than five percent of the babies born in the U.S.A. contract eye infections at birth. *Chlamydia* bacteria are also probably responsible for one-third of the cases of pneumonia in infants under six months of age. Some 35 000 cases of *Chlamydia*-caused pneumonia were diagnosed in children born in the U.S.A. in 1979.

Gonococcus, the microbe that causes gonorrhea, also affects the eyes of newborns, eventually destroying the cornea. But while gonococci can be eradicated, simply by putting drops of a silver nitrate solution in the newborn child's eyes, only a special tetracycline or erythromycin ointment can save eyes infected by *Chlamydia* — and even these antibiotics are ineffective in treating pneumonia caused by this bacterium.

STD-related salpingitis and urogenital complications in women are increasing dramatically. Since 1966, the number of young Canadian women suffering from salpingitis has almost doubled. Each year in the United States, 212 000 women are hospitalized for salpingitis or acute urethritis. This one consequence of STDs carries a cost of \$60 million.

For women, the main cause of concern is that a single infection results in the obstruction of the Fallopian tubes in 13 percent of cases; the figure climbs to 75 percent after a third occurrence. In the event of fertilization, the ovum may stop halfway between the ovary and the uterus if the women's tubes are damaged and the fetus will try to develop there. This type of pregnancy, termed ectopic, represents a major risk to the mother's life. Moreover, the uterine tubes can become affected to such an extent that they become completely blocked, resulting in sterility. Each year, 150 000 to 200 000 women in the United States become sterile this way.

But of all the regions of the world, Africa has paid the highest price for salpingitis resulting from venereal disease. French anthropologist Anne Retel-

Laurentin has shown that the underpopulation of vast parts of Africa is due to the exceptionally high incidence of STDs. Gonococcal infections in particular have spread to the heart of the continent from the coastal regions where gonorrhea was introduced by the Europeans. "STDs", she explains, "spread mainly among the populations of central Africa, where marital relationships were more unstable. In Upper Volta, for example, the austere Mossi people were practically untouched while neighbouring groups were greatly affected."

"Sexually transmitted diseases cause sterility," says Mrs Retel-Laurentin. Where they affect more than half of the population, no more than two children are born alive to each woman. When the incidence varies between 30 and 50 percent, each woman bears three to four live children. When it is below 10 percent, there is no measurable effect. The anthropologist visited communities completely decimated by STDs in Upper Volta, Central Africa, the province of Kasai-Orientale in Zaire, and Gabon.

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### *The greatest danger is to young women and babies*

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The women who were sterile because of the advanced stage of salpingitis from gonorrhea had been rejected by their husbands. A perpetual source of conflict in households, the "disease of the womb" prevented women from being able to maintain an intimate relationship or to work in the fields. Fortunately, treatment of the gonorrhea led to reconciliation. In Upper Volta, south-eastern Cameroon, and Zaire, extensive antibiotic distribution campaigns were followed by a recovery in the fertility rate. This, according to Mrs Retel-Laurentin, supports her hypothesis on how STDs can cause sterility.

These diseases have had such an impact in central Africa, she explains, because health care was a long time in coming to the inner regions of the continent. In Asia, except in Tibet where the population decreased because of STDs, and in Latin America, except for a few Indian populations decimated by venereal disease, health services followed much more closely the appear-

ance of sterility-causing diseases. "In fact," said the anthropologist during an interview, "if the present outbreak of venereal disease was taken into account, the world population projections would have to be revised downward." For Mrs Retel-Laurentin, what happened in the heart of Africa may be a sign of what could happen elsewhere.

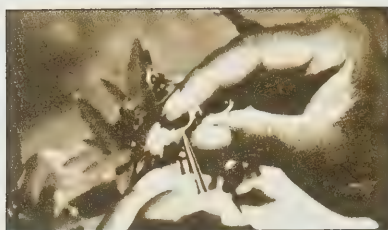
A type of prostitution, carried on by students and young working women, is of particular concern to officials. "I always say that if there is any danger from venereal disease, it does not come from registered prostitutes," claims Latifa Mbacke, a social worker at the dermatology and venereology clinic run by the Social Hygiene Institute in Dakar. All prostitutes working in the Senegalese capital are registered at the clinic, and they are checked regularly. Since the funds provided by the government are insufficient, the clinic charges these patients a small fee — a rare example of taxation (albeit indirect) of the world's oldest profession.

According to the clinic's physician, Claude-Jan Renault-Steens, the prostitutes come for tests because "their health is their main asset". The problem, she says, is unregulated prostitution. In Senegal, many husbands work abroad. Their wives sell their services to the local shopkeeper in return for lower prices. Families send their fifteen- and sixteen-year-old daughters to live with distant relatives in the city. When the wife goes out, the husband takes up with the young visitor, who takes up with the neighbour, and so on. Then there are the *driankes* or "free women" who do the rounds of ministries in order to afford fine clothes and luxuries. Unlike professional prostitutes whose public health booklets are seized when they are infected, these women are not examined regularly and can infect people from all walks of life.

Migration to the cities, the breakdown of traditional society, and poverty create an environment conducive to the spread of STDs in Third World countries. No social group is left untouched, but the worst hit are women, especially young women whose chances of bearing children may be ruined by salpingitis. Infants also suffer terrible risks. In São Paulo, the number of babies born with gonorrheal ophthalmia increased from 18 to 256 per 100 000 births between 1960 and 1976. Most of the children blinded as a result of gonococcal infections are in Third World countries, says Dr Santos, who is concerned that in another decade under-equipped countries may have to cope with a young generation of blind people and invalids.

One of the priorities is to obtain a better picture of the situation in the Third World. The lack of reliable statistics on STDs seriously hampers any national policy initiatives to combat the venereal peril. This is why, at the request of several countries, IDRC has undertaken to finance epidemiological studies on venereal diseases in Latin America and is considering doing the same in Africa. □





# PIGEON PEAS TAKE WING

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*In Kenya, few crops rival improved pigeon peas as  
a source of protein and income*

FIBI MUNENE

*Breeding improved pigeon peas: Obtaining pure lines proved to be difficult.*





Since last May, farmers from the drought-prone regions of Machakos and Kitui in eastern Kenya have been coming, singly or in groups, to Philip Kiio's farm. The attraction is the "miracle" pigeon pea, a dwarf cultivar that not only promises high yields, but matures in only four months, thus offering the possibility of two or more crops each year. It is being tested in Mr Kiio's field.

A drought-resistant shrub measuring up to three metres in height, the pigeon pea (*Cajanus cajan*) has edible seeds that contain up to 22 percent protein. Grown on some 115 000 hectares, it is the most important grain legume in Kenya's dry regions and ranks second only to field beans (*Phaseolus vulgaris*) as a source of protein in rural areas. Recent surveys have shown that Kenya is the world's second largest pigeon pea producer.

The humble pigeon pea can survive and produce a reasonable crop even when other crops such as maize and beans wither. In dry years it may be the only food crop available. In 1980, people from a large area of Machakos and Kitui ate little else.

Although cotton-growing is becoming an increasingly important source of income in the semi-arid areas, pigeon peas remain the most important income earner for most families.

Because of the importance of pigeon peas as a food and cash crop in dry areas and the little research that had focused on breeding higher-yielding, more resistant varieties, IDRC has been supporting research on this legume in Uganda and Kenya for more than eight years. The first pigeon pea improvement program in East Africa began in 1969 at Makerere University in Kampala, Uganda, but the program was disrupted by political events in the 1970s.

Dr J.F. Moses Onim, leader of the Kenyan research program, had worked on the Ugandan program as a student. In 1976, IDRC began supporting the continuation of his work, this time at the University of Nairobi's Crop Science Department.

That same year, a major germplasm collection of local pigeon pea varieties was undertaken jointly by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), based in India, and the Crop Science Department. Some 400 varieties were screened at the National Dry Lands Research Station at Katumani and smaller collections have been undertaken every year since to ensure that the genetic base is maintained. There are now some 700 entries in the collection.

The first step to improving pigeon peas was to identify various agronomic factors limiting yields, and major pest and disease problems. The findings are carefully recorded in a paper written by Dr Onim, entitled "Pigeon pea improvement research in Kenya."

A detailed study was made of breeding problems that threatened to slow down the project's progress. Although

the pigeon pea is essentially a self-pollinating crop, it can outcross (breed with relatively unrelated strains) to a large extent under Kenyan conditions, making it very difficult and costly to obtain pure lines.

It was therefore decided to change breeding methods from the pure lines approach to one of population improvement, using pollination by insects to obtain genetic variability from which new varieties could be selected. This proved less costly and time-consuming than trying to minimize outcrossing.

The project also aims to produce plants that are more drought-resistant than the indigenous varieties. Detailed studies of plant physiology were therefore undertaken. They show that the germinating seeds of the improved varieties develop longer roots than the local varieties. And although the transpiration rate (the rate at which water is passed off through the leaves) has increased in the new varieties, they are still capable of higher yields because their roots can reach moisture at deeper soil levels.

Of the 400 varieties screened between 1976 and 1978, six high-yielding cultivars were selected for testing in farmers' fields. In 1979, 12 farmers were given three kilograms of seed and instructed to plant half their field to the improved varieties, the other half to their usual local types, using traditional cultivation methods.

Compared at maturity, the crops showed no significant differences except in yield: The farmers' varieties yielded an average of 1361 kg/ha while the improved varieties yielded 2637 kg/ha, an increase of almost 94 percent.

To date, Dr Onim has identified five high-yielding varieties that are now being tested by 312 farmers. It appears all will mature slightly earlier than the local pigeon peas, normally planted in October and harvested in July.

Studies of the "miracle" dwarf cultivar show that, when planted in October, it reaches maturity in February. A second crop can be harvested in May if the plant is left to grow, or in July if the plant is severely cut back. Farmers can thus manipulate dates of harvest and it seems possible that a third crop could be obtained before the local varieties even bear their first.

Previous attempts to introduce early-maturing, high-yielding, exotic pigeon peas to Kenya were unsuccessful because most had smaller, darker seeds than the local, large, white varieties. By focusing the breeding program on improving local varieties, the new cultivars have the characteristics desired by the farmers.

The new dwarf cultivar is only a metre high while farmers' types grow to three metres. It will thus be easier to harvest. And as it bears its pods near the top, mechanized harvesting should be possible for farmers who wish to engage in large-scale pigeon pea farming, especially as a fallow crop in the wheat-growing areas of Kenya.

Not all of the project's efforts have

been successful, however. Some of the improved cultivars show a high susceptibility to fusarium wilt and, in wet years, to leaf spot disease. Local varieties also show various levels of resistance to disease. All were found to be highly susceptible to leaf spot, and breeding resistance to this disease is now being given serious attention.

Some 158 local pigeon peas have also been selected for wilt resistance and are being screened in the "sick plot" of one of the farmers' fields. Several indigenous varieties have been found resistant to pure strains of wilt pathogen obtained from ICRISAT and are now being tested for resistance to Kenyan strains.

Although pest damage in the farmers' fields has been moderate, studies of resistance to pod-borers and thrips are being carried out. To date, the project has avoided the use of chemical pesticides although this has become a popular form of pest control in Kenya.

According to Dr Onim, the testing of cultivars on farmers' land has helped narrow the gap between the researchers' and the farmers' yields. Scientists are also learning from the farmers' time-proven cultivation methods.

Another benefit of the program is that it draws attention to a staple food crop, usually neglected in agricultural development programs in favour of export crops such as coffee, tea, sisal, and cotton. The success of the pigeon pea project has convinced the Kenyan government and some development agencies that a greater investment in agricultural research appropriate for land use intensification in small-holdings, and on production techniques for areas of low rainfall, is essential if its goals of increasing food supplies are to be reached.

Recently, the United Nations Development Programme (UNDP) added pigeon peas to the grain legumes included in its improvement program in Kenya. In July 1981, a team of ICRISAT scientists visited Kenya to review the pigeon pea research with a view to establishing an outreach station in the country. The Kenyan government has also now requested a cropping systems project, in the same area, that will be built around the improved pigeon peas.

The results of the project have also been presented at several international conferences and workshops, and could have wide application to other pigeon pea-growing countries.

Although Dr Onim cautions that "it is important to be sure about the new pigeon pea varieties before they are released", and that even the "miracle" cultivar has to undergo further testing, the farmers from Machakos who visit Philip Kiio's farm are convinced that most of the problems have been overcome. □

*A Kenyan journalist, Fibi Munene is presently on contract to IDRC, based at the Regional Office for East Africa in Nairobi.*



## JOURNEY ACROSS A PRECARIOUS BRIDGE

Anyone whose sources of information are limited to the mass news media could be forgiven for assuming that the current preoccupation with North-South issues is a relatively new phenomenon. But they would be wrong. As Ernest Corea points out in his new book, *Beyond dialogue*, the North-South disparities of today are deeply rooted in history, and the dialogue has continued, albeit haltingly at times, for a quarter of a century.

Corea is a journalist, author, administrator, and diplomat. A Sri Lankan by birth, he has lived and worked in Singapore, in Africa, in the U.S.A., and in

Canada. A former director of IDRC's Communications Division, he was also the first director of the Centre's new Cooperative Programs unit, and spent many years with the United Nations. He recently returned to the diplomatic life as Sri Lanka's ambassador to the U.S.A. and Mexico, based in Washington.

All of which helps to explain why Corea brings a unique viewpoint to the study of global politics. Anyone who is interested in, concerned about, or confused by the so-called North-South debate will appreciate *Beyond dialogue*.

The book is written with a journalist's personal style

and an insider's insight. It is a short (70 pages), readable essay that traces the North-South split from the twilight days of the colonial era, through the beginnings of the Non-aligned Movement and the Group of 77, to the Brandt Commission and the present day "crisis of development."

The concept of international politics divided along a North-South (as opposed to East-West) axis may be new to the news media, but its usage can be traced back more than two decades. Back to the '50s, when, writes Corea, "it was assumed that half-full lives could be made full with some concessions, some assistance, but without any major alterations in the overall state of relations among countries and peoples."

But the optimism of the '50s proved to be, if not unfounded, at least premature. Independence turned out not to be an instant panacea for the problems of what is now known as the Third World. Because decolonization in itself was not enough — for many countries it was simply a matter of going "from the frying pan into the deep freeze." Real progress, says Corea, requires that the industrialized nations cross a "philosophical bridge"; that they accept the fact that the present global system is dangerously skewed.

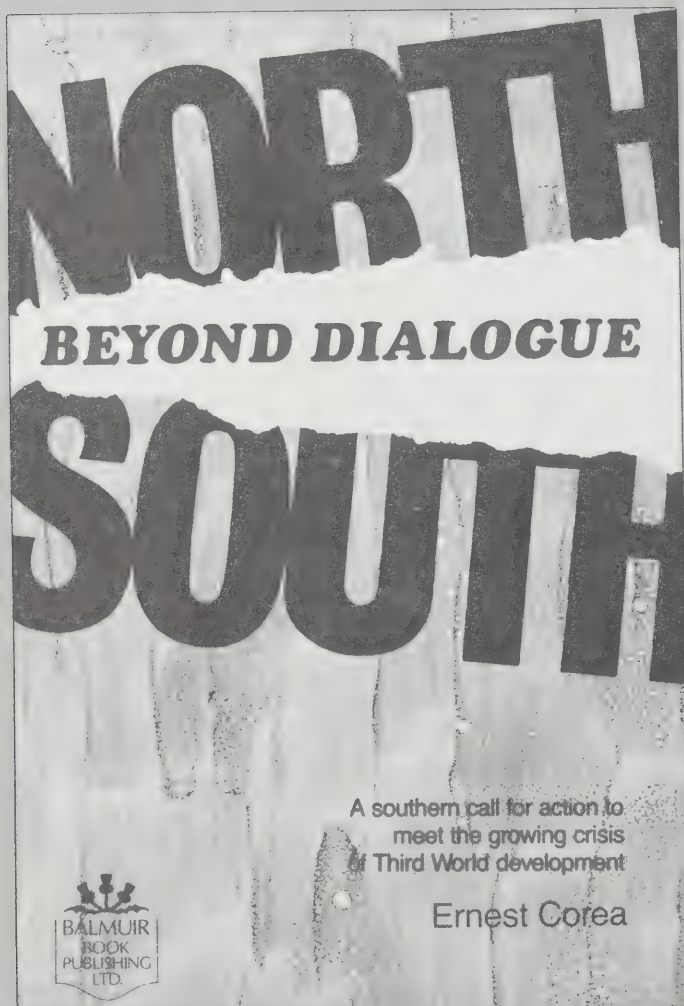
He quotes Prime Minister Trudeau in a speech to Canada's House of Commons last year: "I think it is a matter for all of us to understand that the debate between North and South is more a question of power-sharing than the solving of any particular problem."

Yet in spite of the efforts of two generations of developing-country leaders to bring about a re-ordering of international economic relationships, Corea says 83 percent of the non-aligned countries belong to the destitute category, officially classified as "least developed."

"Now, as then," he writes, "countries which form the Non-aligned Movement, the flag-carrier for the South on a wide range of North-South issues, remain at the far end of the international economic scale... For them and others that appear in adjoining statistical cages, the escape from deprivation is a matter of life and death, not just of verbal mesmerism."

*Beyond dialogue*, however, is more than a historical overview. Corea also presents his own ideas on how to get the stalled machinery of negotiation moving again on its North-South journey across that precarious bridge. It is a journey, he insists, that must be made, for: "Whether one examines the North-South relationship from a strategic, moral or economic perspective..." and Corea does all three... "there is no getting away from the reality that until this relationship is rearranged, the world will continue to be burdened by a sense of global crisis." □

Bob Stanley

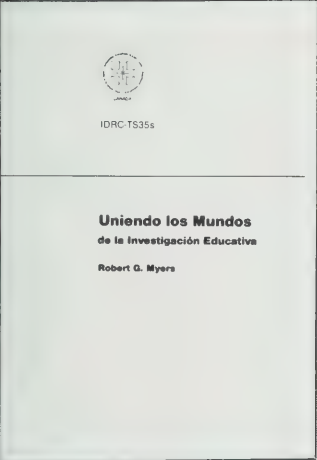


*Beyond dialogue* is published by Balmuir Book Publishing Ltd., Suite 302, 150 Wellington St, Ottawa, Canada. A limited number of copies are available free of charge to developing-country readers. Contact Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9.



**Uniendo los mundos de la investigación educativa**, Robert G. Myers. Published in August 1981, IDRC-TS35s.

The Spanish edition of *Connecting worlds* (IDRC-TS35e), this publication looks at three sets of connections commonly assumed to be weak in educational research: between researchers in the First and Third Worlds; among researchers in the Third World; and between researchers in education and other fields. The focus is on Latin America, although Myers presents observations and suggestions for improving communication across worlds of research in other developing countries.



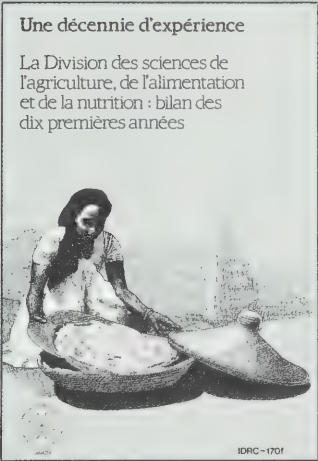
**Teach yourself in primary school: proceedings of a seminar held in Quebec City, Canada, 12-15 May 1981.** Published in October 1981.

Jointly sponsored by IDRC and the Institut national de la recherche scientifique, this seminar brought together people with a range of research and development experience in the field of self-instruction in primary school. Drawing on IDRC-sponsored projects in the Philippines, Indonesia, Malaysia, and Jamaica, as well as other work in Liberia and Canada, participants attempted a state-of-the-art review of research activities and a projection of future needs in research and application of results. (To be published in French also.)

**Une décennie d'expérience : la division des sciences de l'agriculture, de l'alimentation et de la nutrition. Bilan des dix premières années.** Published in September 1981, IDRC-170f.

This publication (a translation of *A decade of learning*, IDRC-170e) reviews the projects and programs of IDRC's Agriculture, Food and Nutrition Sciences

Division during its first 10 years of operation. The history, philosophy, and style of the division are presented along with an examination of activities in each of the principal developing regions, a summation of experience, and an outline of future directions.

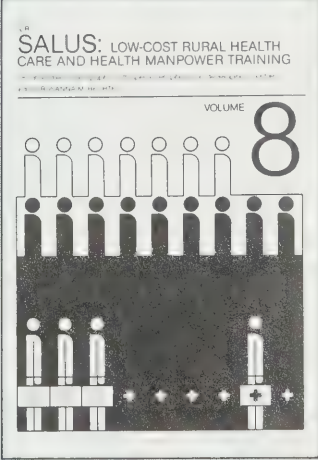


**Projects 1970-1981.** Published in October 1981. A comprehensive listing of all IDRC-supported projects from the Centre's first year of operation up to the end of the 1980-81 fiscal year. A short summary of each project is provided, together with information on recipients, funding, and duration. An extensive subject and

country index is provided. (Also published in French.)

**SALUS: low-cost rural health and manpower training: an annotated bibliography with special emphasis on developing countries, volume 8.** Rosanna M. Bechtel, editor. Published in October 1981, 142 pages, IDRC-173e.

This is the eighth volume of a series of bibliographies that compiles and coordinates information, both published and unpublished, on non-traditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and use of health workers.







INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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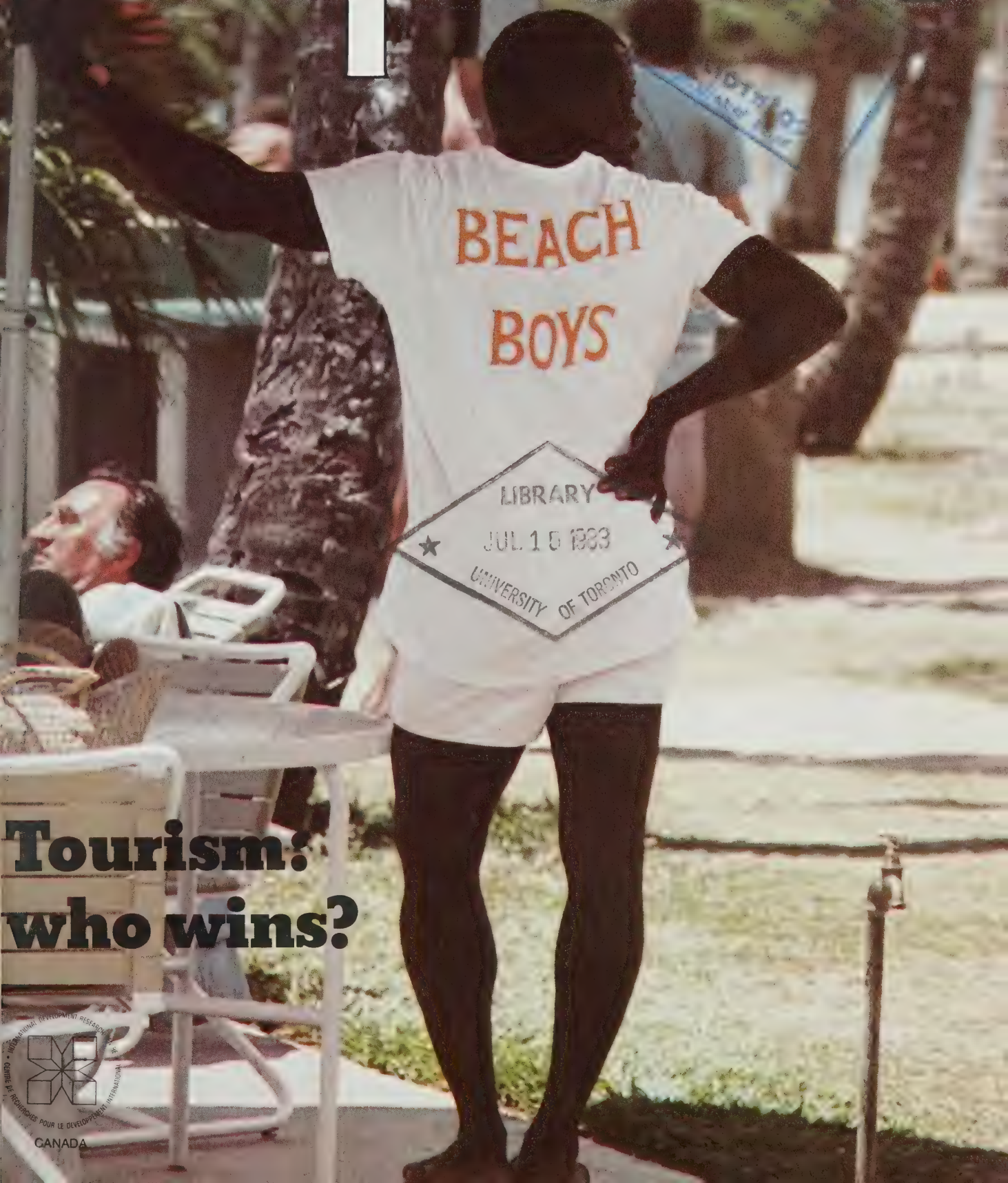
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VOLUME 10 NUMBER 4 — JANUARY 1982

Government  
Publications

# Reports

THE  
DRC



**Tourism:  
who wins?**



# LETTERS

## Grain correction

I read your article "Fuelling controversy" in the July issue of *Reports* and found it interesting. I must point out an error on page 19, where you state "the U.S.A. produces about 20 percent of the world's total grain production (Canada accounts for about the same percentage)." Of the principal grains, Canada produces less than 5 percent of the wheat, 1 percent of the corn, 0 percent rice, and 5 percent of the barley. Of the less important grains, Canada produces 0 sorghum, about 9 percent of the oats, and is a very minor producer of rye. For your information I am enclosing the relevant pages of the publication *Canadian grains industry statistical handbook 79* published by the Canada Grains Council.

Many Canadians have the misconception that Canada is the "bread-basket of the world," a statement which is endlessly repeated from kindergarten age. The statement is just not true and should be rebutted at every opportunity.

H.M. Austenson  
Professor and Head  
of Crop Science  
University of Saskatchewan  
Saskatoon, Canada

*Editors' note: Our source of information, Taking stock: world food security in the eighties, by Douglas Williams and Roger Young (North-South Institute, 1981) stated: "As a major grain producing nation, Canada accounts for one-fifth of all traded wheat and wheat flour, the principal food commodity in international trade." We*

*regret any misinterpretation that may have arisen from our generalizing about production figures based on trade figures.*

## Developing forests

I like the idea of "from destruction to development" of forest resources (*Reports*, April 1981). In Kerala we got rid of many useless trees many years ago, but planted rubber or other trees in their place. So although the trees were cut down, many more useful trees were planted. Kerala looks much greener today than it did some 25 years ago.

But the situation here in the North of India is very alarming. People just cut down all the forest trees and no one wants to plant any. We live close to a forest here and I can see about 300 people stealing wood every day from a very small area around the mission.

I was always fond of trees and so have planted a few hundred of them here. Many of these trees were brought from Kerala and are not seen in the North. As a result, many people come here to see, for the first time in their lives, rubber trees and the few other varieties I have.

Fr. Joseph Cheruvil  
St. Paul's Church  
Giridih, Bihar  
India

## Goats rehabilitated

I was very happy to see a brief on the role of sheep and goats in environmental protection and as sources of milk (*Reports*, January 1981). Your comment that perhaps these species of livestock should be rehabilitated in official development policies was

very welcome indeed. I am sure that all agriculturists will agree that poor management of any grazing species of livestock will lead to the destruction of the environment. Hence, the destruction of the vegetation by these animals should lie squarely on the shoulders of the livestock owners.

Sheep and goats have several advantages over cattle and water buffaloes. They reproduce faster, reach maturity earlier, have a higher frequency of multiple births, and their smaller carcasses are easier to dispose of by a single household, eliminating the need for meat storage facilities. They have, in addition, a lower capital value and are thus more readily slaughtered for meat by families in rural and urban areas. Again, their smaller size makes them easier to handle and feed. The goat owners derive a lot of benefit in terms of meat, milk, skins, and manure from these small ruminants.

I personally feel that governments of African countries where sheep and goats are numerically important should, from time to time, provide farmers with better bucks to avoid inbreeding, and to improve milk yield and size of the animals. There is a need to understand the nutritional requirements of these animals with a view to increasing growth rate and hence shortening the time needed to reach reproductive age and slaughter weight. Studies on these animals in Tanzania have shown that mortality rate of kids and lambs can be very

high if housing is poor and if little attempt is made to control both internal and external parasites.

Finally, it is gratifying that the International Livestock Centre for Africa (ILCA), as well as individual African countries, has embarked on studies of farming systems aimed at increasing the productivity of these animals. I feel that these studies should also aim at solving some of the above bottlenecks in farmers' flocks.

M.L. Kyomo  
University of Tanzania  
Morogoro, Tanzania

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports,  
P.O. Box 8500, Ottawa  
Canada K1G 3H9*



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O.Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feterbaum. *Staff photographer*: Neill McKee.

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**Cover:** *The ingredients of tourism — sun, sand, sea, and service. Tourists lounge in Antigua while their dollars work for development. Is tourism in developing countries the new wave of colonialism, or a way of turning geography into industry? See article page 4. Photo: Horst Ehrich*

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 30677, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Repub-

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## CHARTER FLIGHT DEVELOPMENT

BOB STANLEY

**E**merging from the clammy interior of the Great Pyramid at Giza, the little group of tourists blink in the bright desert sunlight and gratefully fill their lungs with relatively clear air. Their way back down is blocked by an old man who looks as if he might have been there when the pyramids

were new. With a toothless grin he proffers a plastic bucket containing half-a-dozen bottles of Coca Cola floating in cold water. Several avail themselves of his offer, pressing a few piastres into his hand before making their way to the waiting minibus, an air-conditioned Mercedes, for the ride back

to the new downtown Cairo Holiday Inn.

Tomorrow it will be a trip to the old market to pick up some plaster reproductions of ancient Egyptian friezes, or perhaps a cruise on the Nile in a *dhow* that also looks as if it comes from the age of the pharaohs. And then on to the



*Service with a smile — for a price. Tourism brings in much-needed foreign exchange and creates jobs in developing countries, here in Jamaica. But at what cost?*

coast, to Alexandria, to soak up some sun on its Mediterranean beaches.

They are doing what tourists have always done: taking in a little sightseeing, a little history, a little souvenir hunting, a little sunbathing. It is what tourists are doing all over the world with minor variations — you go to Africa for the animals, Thailand for its temples, the Caribbean for calypso — and always there is sunshine, and a beach somewhere nearby.

What is different today is the number of people who are doing it — perhaps one-and-a-half billion of them! And the numbers are growing. The growth of tourism in the past 25 years or so has been nothing short of phenomenal, until today it has attained the status of the second largest trade item in the world, surpassed in world trade only by oil.

Earnings from international tourism alone amounted to an estimated U.S. \$75 billion in 1979, and have been increasing at a steady 7 to 8 percent for the past two decades. Even the energy crisis and subsequent recession failed to put more than a momentary damper on the world's leading growth industry.

Among the beneficiaries of this travel boom have been an increasing number of developing-country regions, which, with the exception of the Middle East, have steadily enlarged their share of the world tourism market since the 1950s. They have the prerequisites: sun, sea, sand, cheap land, cheap labour, and governments willing to make concessions in order to obtain a steady source of desperately needed foreign exchange.

This has not happened by accident. Far from stumbling on tourism as a source of foreign exchange, developing countries have been actively encouraged and assisted to establish and expand their tourist facilities as a means of economic development. The various agencies of the United Nations (UN) have been particularly active in this regard.

During the '60s and '70s, the World Bank and its affiliates took the lead in providing aid money to develop new tourist facilities. The International Labour Organization (ILO) organizes training and education programs for trades related to tourism, and they are funded by the UN Development Programme (UNDP). The UN Educational, Scientific and Cultural Organization (Unesco) studies historic sites in developing countries with a view to their tourist potential.

Further support comes from the UN Conference on Trade and Development (UNCTAD). In a report on tourism policy it states that "expansion of world travel can bring significant benefits to the economies of developing countries." And the report adds: "In many respects

the travel market is also one that they can more easily tap than many other export markets, especially as it involves the service trades."

The World Tourism Organization (WTO) is eloquent in its description of tourism as a means of contributing to "international understanding, peace, prosperity, and universal respect for, and observance of, human rights and fundamental freedom for all."

Tourism, however, has always been the subject of heated controversy, particularly in respect to its effects on the social and cultural life of the people who must act as hosts, willing or not, to the sensation-seeking hordes who descend on their communities each holiday season. There are those, too, who question just how much of the tourist dollar stays in the host country, and some who claim that the costs in fact outweigh the benefits.

That there is a wide divergence of

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*For good or ill,  
tourism has an  
important impact  
on developing  
countries*

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opinion on the subject is not surprising, given the complexity of the issues involved, and the general lack of accurate statistics. One study by WTO, for example, lists no less than 133 factors that determine travel demand. Different countries or regions face different problems, depending on a wide variety of factors. It is virtually impossible to compare countries as divergent in every way as, say, Nepal and Barbados. Yet both support a thriving tourist industry.

One common factor in the economic equation, however, is something the economists call "leakages". These are the foreign exchange costs of the tourism industry, that must be balanced against the money the tourists bring. These costs run all the way from imported building materials, equipment and furnishings for luxury "international standard" hotels, to the food, French wine and Scotch whisky needed to ensure that the visitors will not go without their comforts. One conservative estimate puts the cost of imported materials at about 25 percent during

normal operation but, depending on location and the state of the local economy, the figure may run much higher. And of course most of the major hotels are owned by international chains, so much of the profit goes out of the country.

Then there are the ancillary costs for the construction of airports, roads, sewers and other services to provide easy access and every comfort for the tourists. This infrastructure may cost the developing country as much as 80 percent of the capital cost of the new hotel — perhaps in a country where the majority of the people have neither running water nor sanitary toilets, and will receive little direct benefit from these new facilities.

There are other, hidden, costs too. Governments often must provide incentives to persuade developers to locate in their countries. These include tax exemptions or reductions, duty free imports, special work permits for foreign workers, and construction of additional recreational facilities to attract the tourists. There is also the cost of advertising and promotion, which in extreme cases may run as high as U.S. \$10 per tourist.

On the credit side, tourism does provide both direct and indirect employment. It may also help to stimulate, or even create, local industries — construction, furniture manufacture, handicrafts, agriculture — to meet the tourists' needs. In the Gambia, one of Africa's fastest-growing tourist destinations, it is claimed that for every 1000 "tourist beds" there are 5000 jobs.

Certainly UNCTAD has few reservations about tourism's profitability. Its report states: "Even where imports of capital goods are high in relation to current receipts from tourism the foreign exchange cost can be recouped in a relatively short time. The evidence suggests that tourism can be not only an important, but also, in terms of the resources that need to be devoted to it, a relatively efficient earner of foreign exchange."

The report also points out, however, that increased incomes resulting from a thriving tourist industry may tend to be spent on imported consumer goods in imitation of the tourists' lifestyle.

Another contentious issue is the question of airlines. Not one of the world's 30 biggest airlines is based in a developing country. Many of the major North American and European lines have ties with the international hotel chains, some even own them. The result is that they can arrange package tours at prices with which local operators simply cannot compete.

Government attempts to protect national airlines by restricting competition often means that the tour operators simply stay away. Hoteliers in Nepal, for instance, found themselves in a bitter public debate last year over a proposal to allow in charter flights from Europe and Japan. The proposal was strongly opposed by Royal Nepal Airlines, which claimed it would mean "ruinous competition." The hotels, ex-



perienicing decreasing room occupancy rates, blamed it on the airline's monopoly, and claimed the policy was pulling down the tourist industry simply to protect the airline.

A study by the Economist Intelligence Unit suggests two possible solutions to this kind of problem: Either require tour operators to use the national airline for a substantial proportion of their tours, or require a royalty payment from approved foreign charter airlines. These and other measures, says the study, should help to "tilt the supply/demand equation in favour of the LDCs."

Complicating all the economic issues is the lack of accurate statistics vital to the formulation of effective policies. Figures on how many people travel, where they come from, how much they spend, are often no more than educated guesses. And, as the Economist study wryly points out: those who make the policy often are not aware of how little they know.

Most tourist-receiving countries are aware of the problem, however. IDRC has received a number of requests for assistance to carry out research into the economic aspects of tourism. In cooperation with the Caribbean Tourism Research and Development Centre (CTRC) and several national research teams, the Centre supported a two-year study involving seven countries. The objective of this coordinated effort, the first of its kind, was to provide an

accurate analysis of the economic impact of tourism in the islands, with particular emphasis on employment, foreign exchange earnings, and links to other sectors of the economy.

A summary of the project's findings and recommendations was presented to the fourth annual Caribbean Tourism Conference, at which delegates asked for the findings to be widely disseminated in the region. A final report is now in preparation, and will be published by IDRC.

A second IDRC-supported project, still underway, is studying the economics of tourism in five Asian countries. Because of the much more diversified economy of the region, the emphasis here is on comparing tourism with other foreign exchange earning industries, and on finding ways to maximize the economic benefits of the tourist industry.

Separating the economic from the social and cultural impact, however, is not always easy, or even possible. Environmentalists around the world admire Kenya's justifiably famous game parks, and there is no doubt they are a major tourist attraction. But how to assess the impact on Kenyan farmers who were driven off their land? Or the havoc created for others whose lands bordering the parks are frequently overrun by antelope and elephant.

What of the inherently conservative political influence of an industry that is

so dependent on an image of stability? At the first sign of unrest, tourists stay away in droves. Following rioting in 1977, the government in Bermuda warned: "Tourism is very fragile. Those throwing fire bombs from cars should understand that very soon they will not have a car to throw bombs from." Such fragility represents an easily exploitable weak spot in any nation's economy.

The universal availability of ice-cold Coca Cola is not just an economic phenomenon, it is also a cultural one. It creates not only a demand, but an attitude. Concludes the Economist study: "Whether or not the development of a tourist industry changes a society's values (and whether that is good or bad) there is no doubt that the socio-economic impact can bring about profound changes in the structure of the host society. Major changes and stresses."

Coping with the changes and the stresses, integrating tourism with other industries, and ensuring a fair share of the returns, are the primary concerns of most tourist-receiving developing countries. For many countries there is really no choice. The deputy Prime Minister (and Minister of Tourism and Trade) of Barbados, Bernard St. John, states it bluntly: "Tourism is vital to the economic and social survival of all the Caribbean territories. Indeed, in many instances tourism is the only alternative." □

## SEX AND THE SIMPLE TOURIST

ROWAN SHIRKIE

Prepackaged exotic sex tours are one of the seamier sides of international tourism, especially as they generally involve the exploitation of women in developing countries.

Advertisements in Western European countries offer wallows in the glamorous fleshpots of the Orient. And in South Korea, the Philippines, and Thailand — the main destinations of such tours — hotels, night clubs, bars, discos, and massage parlours have sprung up to provide the services to foreign male tourists.

"In Japan, all the big travel agencies handle large tours, especially to South Korea, where *kisaeng* (meaning prostitute) parties are automatically included in the price," says Jane Cottingham of Isis, a Geneva-based women's rights group that has compiled a dossier on sexual tourism.

The availability of women as a cheap commodity is one of the chief growth incentives of the trade. The spread of poverty and massive displacements of people in rural areas in

Southeast Asia (and other developing regions) has meant that large numbers of women migrate to the cities. With little education or money, they have almost no choice but to become factory workers, domestic servants, or prostitutes. "Each of these is abysmally badly paid and insecure, but the last (prostitution) is probably the most lucrative, and sometimes it is the only alternative," Cottingham says.

"I get 25 *baht* (U.S. \$1.25) per day working in a battery factory," 20-year-old Noi told the *Bangkok Post* recently, "but this is not enough to cover my expenses. How could this be enough to pay for my rent, my food, my bus tickets, and other expenses? And I can tell you, I am thrifty." Noi also supports her parents and eight brothers and sisters who live in an outlying village. She supplements her wages by prostitution. Even then, with the rakeoffs of hotel and club owners, "guides" or pimps, and tour operators, there is not much left over.

None of the governments of the countries in question admit that a flourishing sexual tourism exists: Prostitution is

illegal, they say, therefore it couldn't possibly be part of the tourist industry.

Church and women's groups have taken action to try to stop the fleshy trade. In 1973, disembarking Japanese *kisaeng* tourists were greeted by placard-waving South Korean women offering to throw them back across the sea. More recently, the Christian Conference of Asia sponsored a workshop on international tourism in the Philippines, and renewed a process of international pressure on "sending" countries to ban sex tours.

But, as Jane Cottingham points out, tourism is lucrative, and sex tours are particularly so in some developing countries. Banning prostitution may only create even greater hardship for the already impoverished women engaged in it. As long as the economies of poor countries remain so dependent on those of the rich, the poorest of the poor will have little control over their lives. Says Cottingham: "Women will continue to pay the price, and the human race will continue to be the worse for it."



The optimistic view of tourism and development is summed up by M.D. Davis, a World Bank expert, who said in 1966 that "for developing countries, tourism represents the true motor of development, much like industry was for Europe in the 19th century." And certainly, tourism was a factor of economic growth between 1960 and 1973. In that last year, the World Tourism Organization (WTO) estimated that some 29.4 million tourists worldwide had generated revenues of U.S. \$5.7 billion.

In Africa, tourism's increase of 250 percent between 1962 and 1972 was also matched by increases in revenues of 224 percent. And despite a drop in 1973-74, the world tourism industry has continued to grow.

In 1979, some 5.3 million tourists arrived in Africa. But this number is only two percent of the world's total of 270 million leisure travellers, and it is very unevenly distributed: 62 percent of visitors to Africa went to the North, 22 percent to East and South Africa, 11 percent to West Africa, and 5 percent to Central Africa.

Africa's \$1.8 billion share of world tourism revenues, at 2.4 percent of the world total, is equally small.

But if these numbers are low compared to Europe and North America, who host 85 percent of the world's tourists and claim 80 percent of the revenues, they at least point to Africa's future potential in the development of the industry.

A number of benefits are expected to accrue from the development of the industry. First, tourism contributes to improving the balance of payments by bringing in much needed foreign exchange. And unlike other export sectors, tourism is not subject to deteriorating terms of exchange. The state is the main beneficiary of tourism, as 20 percent of revenues are collected by governments through taxation.

The tourist industry also creates employment and stimulates various sectors of the economy such as agriculture, construction, and handicrafts. A joint 1979 Unesco and World Bank publication (*Tourism: passport for development*) indicates that tourism creates between 3 and 10 percent of jobs both directly through hotels, restaurants, travel agencies, etc., and indirectly in related industries such as transport. Women and young people benefit most from these employment opportunities and incomes generally rise as a result.

But in most African countries, the tourism industry is not capable of bringing about rapid economic growth, nor can it contribute significantly to integrated national development. Some economists even consider that the benefits of tourism are lower



*Traditional dancers in Kenya keep history alive.*

## SEE AFRICA FIRST

MOMAR KÉBÉ NDIAYE

### *Africa prepares to go after a greater share of the tourist industry*

than the investments required.

In a study carried out for Unesco in 1978, Senegalese economist Elimane Fall stresses the essentially "flexible and fluctuating" character of tourism. In fact, he says, the tourist flow can be turned aside or stopped at any moment following political, economic, or social events in the host country. And it is this uncertainty that makes it difficult to integrate the tourism sector in long-term plans.

Moreover, tourism in Africa suffers from incomplete and inadequate planning. The Unesco-World Bank study noted that planners in most African countries did not assess whether the needs of tourism corresponded to the particular geographical and resource characteristics, economic development levels, political and administrative institutions, or traditions of the areas where facilities were implanted.

Moreover, because of the low level of development in African countries, the tourism industry cannot be exploited solely by individual national efforts. The structure of the industry, the high levels of capital needed, and the human capabilities required are such that the

product and its management are often under the control of foreign enterprises. In fact, of the world's 2500 tour operators, Africa has only 92, and only 533 of the world's 31 000 travel agencies. Thus, much of the foreign exchange never arrives in the host country.

Investment codes in African countries, particularly in West Africa, grant special tax exemptions to encourage tourism, but in spite of these encouragements only 20 percent of tourism's revenues actually remain in the host country.

Some economists further estimate that large-scale development of the tourism industry can contribute to inflation in a little-developed economy and that, because of the weak services sector, it cannot foster development generally. This was shown in a study carried out by the Development Centre of the Organization for Economic Co-operation and Development (OECD) that also revealed the net effect of tourism on national and individual incomes was negative, except in some countries like Kenya and the Bahamas.

Tourism can have potentially devastating effects on culture and social equilibrium. Cultural shock often results in changes of values and attitudes in receiving countries — a break with traditional means of production, degradation of national culture, exacerbation of social differences, falsification of folklore and artistic activities. Nevertheless, tourism has sometimes contributed to strengthening national identity and culture in

some countries, as museums and craft centres were established, historical sites preserved, and artistic activities encouraged.

Whether tourism becomes a base for the development of non-industrialized countries and meets the development objectives set for it depends on its inclusion in a dynamic set of export industries. The African Regional Conference organized by the WTO and the African Economic Community in Gambia in 1978 set guidelines for the development of the industry on the continent. The 35 participating countries recommended a better definition and control of the "African tourist product".

The Conference also insisted on the need to promote inter-African tourism as a potential tool for achieving autonomy in Africa. In fact, while the number of tourists who do not stray far from home is estimated at 86 percent in Europe, it is only 12 percent in Africa. The extension of this travel would open up new perspectives for tourism in Africa. □

*Momar Kébé Ndiaye is a Senegalese journalist presently studying in France.*



# MATENI MATATU

Throughout Kenya, *matatus* ply the roads in search of fares.

Often poorly maintained and overloaded, these ubiquitous vehicles are associated with such traffic offences as obstruction of other vehicles and careless driving.

Kenya's *matatus* are any vehicles weighing up to three tonnes that carry passengers and goods for a fee. Legally, they are treated as private vehicles and this limits the authority of the traffic law enforcers over their operations. In 1973, through a presidential decree, the government exempted *matatus* from commercial licensing. So, unlike other modes of public transport, they are not obliged to restrict passenger loading or carry safety equipment.

But despite the objections raised against the lack of insurance coverage, reckless driving, and other practices, *matatus* have thrived and become a prominent feature of Kenya's public transport system. Many people prefer *matatus* to buses because they are faster and will accept goods to carry. *Matatus* also offer slightly lower fares than buses. For Nairobi workers in particular, peak-time travel to and from places of work has always been a problem. Buses are packed to the point of bursting. The only alternative for low-income workers is the *matatu* — or walking.

Initially, *matatus* were pirate taxis that in the late 1960s got their name from the original charge of 30 cents — *mateni matatu* — per trip from the city centre to any of the Nairobi suburbs. Because of the tremendous population growth in Nairobi and the inability of

the buses to cope with the increased demand for public transport, the number of unlicensed *matatus* continued to grow.

The *matatu's* role in generating employment is largely acknowledged. It is estimated that the *matatu* enterprise has created some 16 000 to 22 000 jobs. Youths, known as *manambas* (which means numbers) — a name that originated from the numbers given to the bus routes in the city — earn their living by soliciting passengers. Informal vehicle repair and vehicle conversion workshops derive a considerable part of their businesses from the *matatu* operators. The conversion of pickups and vans into *matatus* by adding seats and windows is carried out by local craftsmen. There are at least 50 repair facilities in Nairobi that service *matatus*.

Traffic planners first thought that enforcing stringent regulations could control the number of *matatus* on any route. But even before the government reversed its policy on *matatus* in 1973, these measures had proved ineffectual. The number of *matatus* continued to grow. The most recent estimates suggest that there are some 3000 vehicles serving as *matatus* in Nairobi alone.

The Kenyan government and Nairobi City Council have accepted the *matatus'* role as a passenger service complementing the buses. And, since 1980, IDRC has been supporting a policy-oriented study on the *matatu* mode of public transport in metro-Nairobi because of its role in meeting transport needs of lower income groups. The research is being carried out by the Mazingira Institute, a nonprofit organi-

zation established in Kenya to look at development and environmental issues, with a focus on low-income groups.

An interim project report has identified interest groups from both the private and public sectors of the economy, and has raised issues for discussion concerning the proposed Kenya Urban Transport Project and the integration of *matatus* within the country's public transport systems. Standardization of the *matatu* services and implementation of the proposed *Matatu* Assistance Scheme are major components of the project.

At present, many *matatu* operators overload the vehicles and speed to increase their income in order to repay short-term loans. It is considered that if "soft" loans, payable over three or more years, were available to the *matatu* operators, passenger comfort and safety would improve. The scheme also proposes to improve informal repair facilities, which are now housed in temporary shelters, if at all.

The government is also looking into the implications of converting *matatus* to diesel fuels. A prototype vehicle, a 14-seater diesel-operated minibus whose body incorporates safety measures, is undergoing tests. While the common opinion is that the new vehicle might be beneficial, especially in saving foreign currency in petroleum imports, Mazingira's study will investigate the effects the change in the fuel is likely to have on *matatu* operators.

The research findings so far indicate that the informal garages dependent on the *matatu* business may suffer from the fuel change because the mechanics do not have the skills needed to handle diesel engines.

The study will attempt to provide policymakers with options to deal with the issues concerning the future of the *matatu* enterprises. Documentation on *matatu* ownership and enterprises, as well as the views of *matatu* users and other interest groups, will be gathered to provide transportation planners with a comprehensive data base on which to base policies.

But the study's greatest contribution to transport policy and planning may well be intangible, by providing a much-needed link between the public, *matatu* operators, policymakers, international organizations, sources of financing, and other parties concerned about the future of *matatus*. □



A "new" *matatu* in Nairobi, Kenya. Researchers and city planners are working at better integrating this popular mode of transportation in urban transport systems.

Fibi Munene is a Kenyan journalist presently on contract with IDRC in the Regional Office for East Africa.



# FORGING RESEARCH LINKS

IDRC's Cooperative Programs Unit was set up early in 1981 to administer joint Canada-developing-country research projects (see Reports 10(1), April 1981). Jim Mullin, formerly with Canada's Ministry of State for Science and Technology, took over as Director of the Unit in August 1981. He replaced Ernest Corea, the Cooperative Programs' first Director, who was appointed Sri Lankan Ambassador to the U.S.A. and Mexico.

In its first full year of operations, the Unit had a budget of Cdn\$1 million and 10 projects have been supported to date. The budget for the 1982/83 fiscal year is \$2.5 million.

In the following interview, Mr Mullin outlines the thrust of the program.

**Reports:** Could you briefly outline the objectives of IDRC's Cooperative Programs Unit?

**Mullin:** The program aims to promote collaboration between research groups in Canada and in the developing world in the execution of projects that will address problems of Third World development. In addition, the program has three other important objectives. First is the development of the scientific and technological research capacity of participating Third World institutions by way of improving their opportunities for collaboration with the Canadian scientific community. The second is to create channels of communication among scientists through which the results of successful research in Canada can be transferred to researchers in developing countries. Last is the use of collaboration as a means of influencing Canadian research groups to direct them towards a greater number and variety of Third World concerns.

**Reports:** Promoting collaboration between research groups in Canada and developing countries is a broad enterprise. Can you define the scope or boundaries of the program more specifically?

**Mullin:** The program is designed to foster collaboration between groups rather than individuals. It is open to all sectors — university, government, and the private sector — and to those disciplines that can be shown to contribute to the economic or social development of less industrialized nations.

Basically, it is designed to promote access by developing countries to research strengths that exist in Canada, not to establish new research

capacity in Canada itself. The aim is to support research collaboration, not technical assistance projects; to support research projects of up to three years duration, not broad, unfocused programs. We see it including support for training developing-country nationals within the context of approved research projects, but stopping short of financing training that is divorced from a specific research activity.

**Reports:** Within those boundaries, what items can be funded?

**Mullin:** Funds can be appropriated for direct research costs within the developing country involved and in Canada, for the cost of exchanging staff between participating groups, and as well, for training related to the projects being financed. Materials are also covered. This means minor laboratory equipment, not basic infrastructure.

In addition, and given an interesting preliminary proposal, pre-project financing can be made available to ensure that the developing-country partner has a full opportunity to participate in project proposal planning.

**Reports:** How will project proposals be evaluated?

**Mullin:** Proposals will be evaluated against a number of criteria dealing with the developing country's interest and commitment, the scientific merit of the proposal, the arrangements proposed to ensure collaboration, and the potential for application of the results.

In particular, the following criteria will be important:

- Developing-country interest: Is the proposed project clearly designed to strengthen the research capacity of the institutions or groups involved? Have they been given a significant role in the planning and execution of the project? Does the project have the support of all the institutions involved and what support are they willing to offer — funds, staff time, facilities, etc.?
- Institutional support on the developing-country side will be taken by IDRC as one indicator that the proposed research activity addresses a meaningful development problem.
- Scientific merit: Is the project scientifically sound? Is the proposed methodology adequately described, and is it appropriate to the problems being addressed? Is the timetable realistic? The scientific merit of proposals will be subject to peer review.

- Institutional considerations: Does the Canadian participant have the scientific capacity required to undertake or play a significant role in the project? Will the project be conducted in a manner that ensures Canadian-developing country partnership? Is it capable of leading to a long-term relationship between the institutions involved?

- Potential for application: Does the developing-country institution involved, or a related institution, have the authority, finances, and so forth to implement the results of the proposed research? Is the project country-specific or would its results be applicable to other developing countries?

I must also point out that proposals falling within the area of competence of IDRC's main program divisions — Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; and Social Sciences — will be administered by those Divisions. Proposals in other areas will be administered by the Cooperative Programs Unit. □

For more information, contact the Cooperative Programs Unit, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9.

## THE FIRST STEP

Proposals submitted either by developing-country or Canadian groups should contain the following information:

- Background: the problem the project addresses and how it relates to the development priorities of the country concerned.

- Objectives: the scientific objectives to be pursued in the joint research activity.

- Methodology: the research strategy and tentative timetable as well as an explanation of how cooperative elements will be organized.

- Utilization of results: who will use the results and how.

- Budget: costs in Canada and developing country as well as costs for personnel exchange. All other resource contributions, should be outlined, particularly those provided by the developing country and Canadian institutions involved.



# THE YELLOW PERIL

LENNOX GRANT

*Research has a deadline  
to find the source  
of yellow fever in the Caribbean*

At some time near the turn of the century, yellow fever will strike again in the Caribbean island of Trinidad. In the forests, monkeys will fall dead from the trees. In nearby villages, human victims will suffer kidney and liver damage, and show the yellowing skin and eyes that give the fever its name.

Reports of these events will throw a scare into the population. But the outbreak, if it really occurs, will have been expected. Public health officials know that yellow fever reappears, as if from nowhere, every 20 years. They also recognize the ominous stages of the dreaded "cycle" of infection: dying, virus-ridden monkeys infect jungle mosquitoes; jungle mosquitoes infect bush-roaming humans; these in turn infect household mosquitoes whose bite then makes more people feverish and yellow. Thus, a "jungle cycle" connects with an "urban cycle." But where does it all begin? From what "reservoir" of infection do the monkeys pick up the virus?

At the Caribbean Epidemiology Centre (CAREC), an internationally supported complex in Port of Spain, a team of investigators are working to track the virus to its "reservoir" or source. "The virus emanates every 20 years from nobody quite knows where," says virologist Barbara Hull, leader of the team. "We know it appears in monkeys because they die from it. If monkeys tolerated the infection, we'd probably never know even that much."

In November 1978, dead monkeys were found in the forests of Guayaguayare, South Trinidad. The yellow fever epizootic among the monkeys soon became an epidemic among Trinadians. There were only 18 diagnosed cases, including seven deaths, mostly people who had been in the forests. But in towns far from Guayaguayare, crowds rushed to health centres to be vaccinated. "Everything else took a back seat," Miss Hull recalls. Trinidad's 18 cases represented 10 percent of cases reported in seven Latin American and Caribbean countries that year, although Trinidad's population is only



one percent of the total.

In neighbouring Caribbean islands more heavily dependent on tourism, the news out of Trinidad was only slightly less alarming. Yellow fever's reputation, going back nearly 200 years, is one to be feared. According to Dr Elisha Tikasingh, an entomologist and parasitologist who runs the project's field operations: "Yellow fever was generally known as a seaport disease, carried on ships from port to port in the Caribbean." The bad publicity from only one case among, say, North American and European cruise ship visitors could mean disaster for a vital industry.

The need to respond to such a threat underscores the importance of CAREC, the Caribbean's link with an international network of centres for disease surveillance and control. CAREC is supported by 19 Caribbean governments and by the PanAmerican Health Organization (PAHO), which also runs the Centre. Working closely with Ministries of Health, CAREC provides backup laboratory facilities for disease prevention and diagnosis, training, and research. Three years before the November 1978 out-

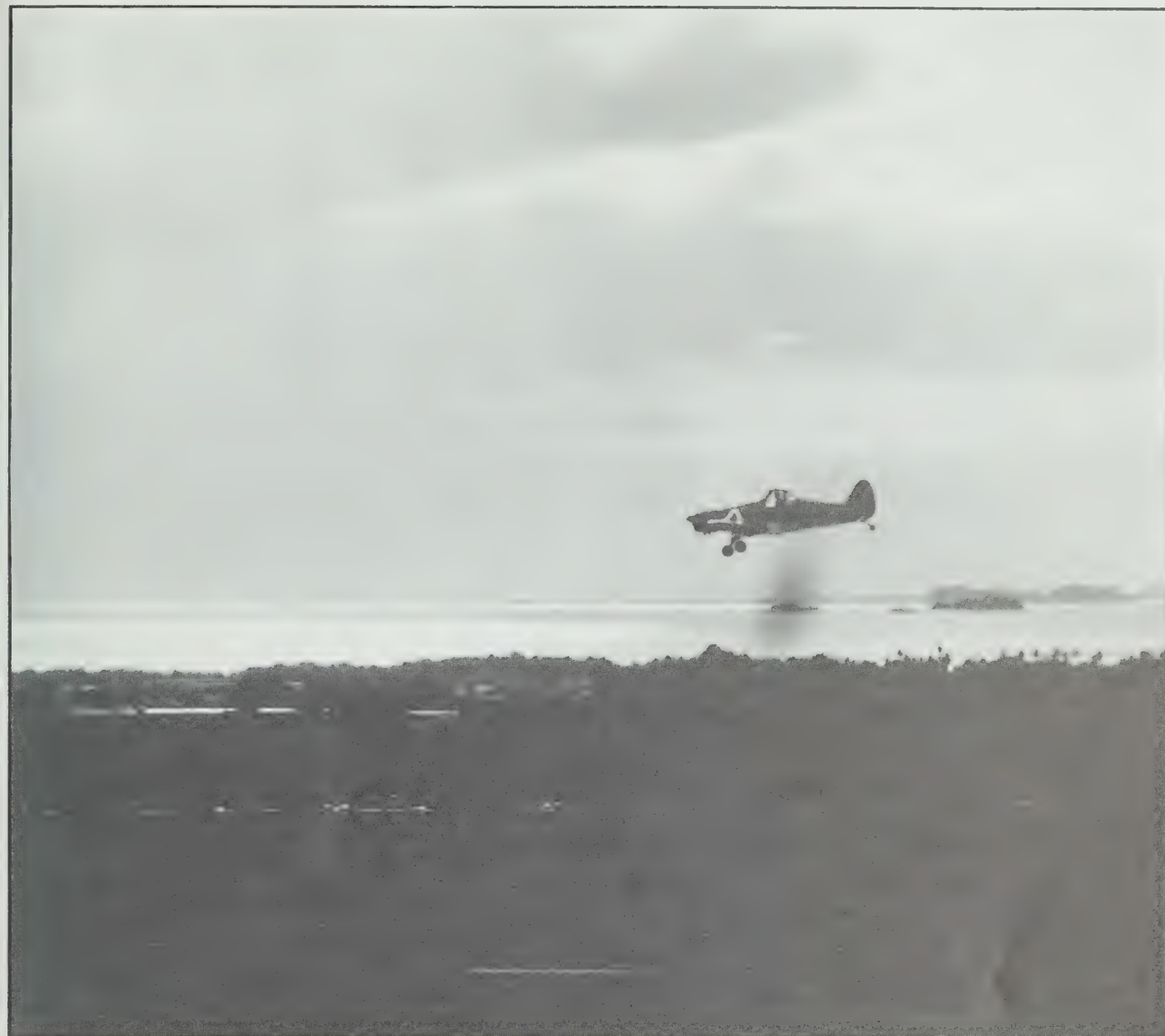
*Small airplanes spray against the mosquito carriers of yellow fever during the 1978 epidemic in Trinidad.*

break, CAREC scientists had joined with Trinidad's Ministry of Health personnel to prepare for the epidemic. "We tried hard to get people immunized, but people don't bother until it really happens," says Miss Hull. By the time the epidemic was over, however, some 98 percent of the population had been vaccinated against yellow fever. By then, too, the vector control division had all but eliminated the *Aedes aegypti*, the household mosquito that spreads the disease in urban areas.

The scare was over, but health officials knew the disease was only gone for a time. Unless they could discover where the virus resides and abort the cycle of infection, yellow fever was sure to return on schedule, a generation away. There thus remained a job of scientific detective work to uncover the habitat of the virus between the times when it surfaces in monkeys and humans.

A research project with that main





objective began at CAREC in March 1980, after the last epidemic ended. The project, supported by the United Kingdom's Medical Research Council, the Trinidad and Tobago government, and IDRC, also aims to find the reservoir of the virus that causes dengue, a disease also spread by the *Aedes aegypti* and whose symptoms resemble those of a mild yellow fever attack. A dengue (pronounced *den-gay*) epidemic hit Trinidad in 1977. The virus was an unfamiliar strain, one against which no effective vaccine existed, so after its epidemic phase, dengue remained endemic in the population, with no knowledge of where the virus originated.

Of Trinidad's 150 mosquito species, two are known transmitters of yellow fever and dengue. In the forest, *Haemagogus* picks up the yellow fever virus when it bites infected monkeys in the trees, and injects it into humans working in the forest. When the humans return home, they become prey for the "domesticated" *Aedes aegypti* mosquito that collects the virus with each bite and passes it on to its next victims. The

dengue virus, however, has no forest cycle. It is simply passed on from infected person to susceptible person by the *Aedes* as it bites.

But for the CAREC researchers now searching for the mystery reservoir, no species of mosquito or forest animal is above suspicion. At selected spots in the nearby Changuaramas forest, the field team sets traps for mosquitoes and animals. All animals caught are brought in for examination and autopsy to find traces of the virus. At CAREC, mosquitoes are classified according to "pools", that is, by species and time and place caught. Each pool is ground up and mixed with a liquid. The liquid is then injected either into mice or into mosquito tissue culture obtained by growing larval cells in a nutrient medium. If the virus is present, the mice will become ill in six to eight days. In the cell culture, the virus appears earlier.

In July 1980, the yellow fever virus showed up in two *Haemagogus* pools. By then, all the infected monkeys had died, and the epidemic had been over for five months. This led the researchers to new lines of inquiry. Did the virus

come from a rare mosquito that could have been living five, six months before? "We don't know how long the *Haemagogus* live, or how far they fly, and we need to know it," says Dr Tikasingh. Again, had the virus been transmitted through the egg from mother to young insect? The field team began collecting *Haemagogus* eggs that were bred to adulthood in the laboratory. A third possibility was that some other animal, carrying the virus but resistant to the disease, had transmitted it to the mosquito. But no virus was found in the animals taken from the bush.

Everything points to the need for a study that is wider in scope and longer in term than the present two-year project.

But, as Miss Hull notes, "We're doing what we can with present facilities. With the field team we have, we can only sample some areas. We've just started what must be a long-term study in an area of public health that assumes great importance when there's an epidemic." CAREC has made an early start on a task whose deadline is long-term, but which must occur before the expected return of Trinidad's yellow peril. □



## Mud merits

One of the best solutions to low-cost housing in developing countries is already underfoot — mud.

Mud, adobe, earth, or soil-soil-cement bricks, and other traditional building materials are cheap, readily available, and can be made and used by poor people to build their own homes. In *Mud, mud: the potential of earth-based materials for Third World housing*, development journalist Anil Agarwal points out that although mud is the most widely used building material in the world it is “almost invariably ignored by governments, development banks, and aid agencies.”

Housing programs in developing countries cannot begin to cope with the projected demand for 600 million houses in the next 20 years, because “even in the cities, from one-third to two-thirds of all households are too poor to pay for the cheapest approved dwelling that can be built,” says Agarwal.

Ignored by housing research, reviled by planners as “unsafe, unhealthy, and impermanent,” and discouraged from use through existing construction rules, mud’s potential has been buried.

The greatest technological drawback to mud construction is its vulnerability to damage caused by water, either from rain or rising damp. Yet local practices of adding small amounts of cement, asphalt, lime, cowdung, plant juices, or —

as in Northern Ghana — boiled banana stems, can greatly improve water resistance.

“The cheap cement era — itself a product of cheap energy — is coming to an end,” concludes Agarwal. “And housing planners may have to consider new building materials and technologies, and reconsider traditional materials such as mud.” Researchers and planners must stop paying lip service to mud, and start using it, he says.

(*Mud, mud*, 100 pages, paperback, Earthscan, 10 Percy Street, London W1P 0DR, UK. £2.50/U.S. \$6.25).

## Rural health manuals

Health care throughout the rural areas of developing countries depends increasingly on rural health workers — villagers trained for short periods of time in basic preventive and curative medical care. The expansion of training programs for rural health workers has made obvious the need for suitable books, adapted to the local environment.

To meet this need, the Kenya-based African Medical and Research Foundation (AMREF) has published a series of rural health manuals written specifically for front-line health workers in East Africa. The manuals — covering topics ranging from child care, obstetric emergencies, and communicable diseases, to occupational health and management schedules for dispensaries — have been drafted by experts and revised by the people

who will have to use them. The AMREF also publishes a journal for medical auxiliaries and a lay health education journal.

The AMREF is a charitable organization committed to teaching disease prevention and to the continuing education of medical assistants of all kinds. It also runs the East African Flying Doctor Service.

For information contact: African Medical and Research Foundation, Wilson Airport, P.O. Box 30125, Nairobi, Kenya.

## Revolt against IUDs

Women in China are reported to be turning against official family planning programs and having their intra-uterine devices (IUDs) removed clandestinely.

Newspaper accounts published in Canada tell of thousands of women, “primarily in the countryside where conservative-minded peasants are used to large families as a source of security in old age,” who are willing to risk pain, possible death, and punishment to have “backroom operators” remove IUDs.

Official China has condemned the trend and issued a number of directives calling for local authorities to ban the practice as well as to carry out large-scale education programs among the masses to prevent the “sabotage of the birth-control plan.” A provincial court in Jiangsu province recently sentenced a woman to two years in prison for removing IUDs

from commune women.

There is some speculation that women were originally coerced into accepting IUDs, or that they are changing their minds about contraception and now wish to have more children. China is officially trying to contain its population figures at under 1.2 billion as it enters the 21st century.

## Pesticides policies

While the international community appears to be moving towards the formulation of occupational health guidelines to cover the manufacture and use of pesticides, the U.S.A. is contemplating rolling back provisions of existing laws in a way that would likely permit unfettered trade in potentially dangerous products. (See *Reports* 10(3), October 1981.)

A recent international consultation brought together experts from six agencies, including the International Labour Organization (ILO), the World Bank, and the World Health Organization (WHO) to discuss occupational health guidelines for establishing safe practices in the manufacture and use of pesticides and for the iron and steel industries.

The aim of the guidelines is to “help bring about industrialization with health and safety,” and, according to Dr M.A. El-Batawi, Chief of the WHO Office of Occupational Health, “preventive health measures should go hand in hand with the construction of new industries.” The first draft guidelines are due to



be tabled late this year.

Meanwhile, claiming that existing export policy directives requiring the disclosure of domestic U.S. restrictions or bans on pesticides and other potentially hazardous products put U.S. exporters at a "competitive disadvantage," the Reagan administration has drafted plans to loosen regulations significantly. Instead of specific prior notice to importing countries of any restrictions placed on a product, the proposed U.S. plan would substitute a process whereby an international body like the UN would be informed of U.S. bans as they were made, and possibly supplement this information with a once-a-year register of all similar actions. Presumably, it would be up to the importing countries to find out for themselves if any product had a hazardous history.

### **Jojoba blossoms in Brazil**

Moving ever more rapidly down the path toward energy and oil product self-sufficiency through agriculture, Brazil is now reported to be planting 1500 hectares of jojoba near Montalvania in the country's northeastern Minas state.

Jojoba, a plant native to the low rainfall deserts of California and Mexico, produces a colourless, odourless, waxy substance that closely resembles whale oil, presently used for lubricants that must withstand extreme pressure. Used in automatic

transmissions, detergents, emulsifiers, disinfectants, synthetic resins, corrosion inhibitors, and cosmetics, jojoba products are increasingly in demand worldwide.

The Minas North Agroindustrial Company has decided to spend U.S. \$15 million to grow jojoba. It expects returns of \$310 million annually after six years. Plant yields of useful wax are in the range of 2500 litres per hectare. (*World Environment Report*.)

### **The pickleweed potential**

Every year about 200 000 hectares of farmland are lost to agriculture because continual irrigation has caused the soil to become too salty for most plants. Since early farmers first learned to irrigate their fields it is estimated that one-quarter of all irrigated cropland has become too salty to farm.

But the land need not be lost. According to a report in *Science* 81, a family of plants called halophytes may solve the problem, and could soon become an important food crop around the world.

Halophytes grow in sandy, salty soils, and can be irrigated with brackish water, even undiluted seawater. They go by names like saltwort and pickleweed, and some of them have been found to be comparable or even superior in both yield and nutritional value to rice and wheat.

Scientists at the University of Arizona's Environmental Research Laboratory are studying the

plants and collecting samples from around the world to determine if halophyte agriculture is practical. The potential is staggering: In addition to tens of thousands of kilometres of desert coastline, estuarine swamps and tidal flats, there are perhaps 400 million hectares of desert overlying salty underground water sources.

### **Pot-able water**

A novel clay pot water filter invented in Guatemala may help bring safe clean water to rural areas at an affordable cost.

The filter consists of a simple clay pot, into which another clay container is inserted. Silver colloids are mixed into the clay of the inner pot to provide a disinfectant action. Water poured into the inner container filters through the bottom. Efficiency in removing polluting particulate matter and bacteria is reported to be excellent.

In addition to its efficiency, the filter can be produced at low cost (currently less than U.S. \$9) by local craftspeople from local materials. The technology is basically identical to making household pottery, and the pot filter's useful life is reported to be one year, supplying enough potable water for a family of four or five.

The filter won its innovators at the Central American Institute for Research and Industrial Technology in Guatemala, J. Fernando Mazariegos and Julia Alicia de Zeissig,

the annual award of the Inter-American Association for Sanitary and Environmental Engineering in Central America.

### **Environmental journal**

Agriculture and environment: Never was there a closer symbiotic relationship. And it is precisely to examine the interaction between them that *Agriculture and environment* exists — a journal for scientific research on the relationship of agriculture and food production to the biosphere.

The journal aims to serve as a focus for scientists in agriculture, food production, and the environment, as well as for administrators and policymakers concerned with these issues. Topics covered range from the comparisons of different methods of production in relation to soil, water, and air, to the effects of environmental pollutants on agriculture and food.

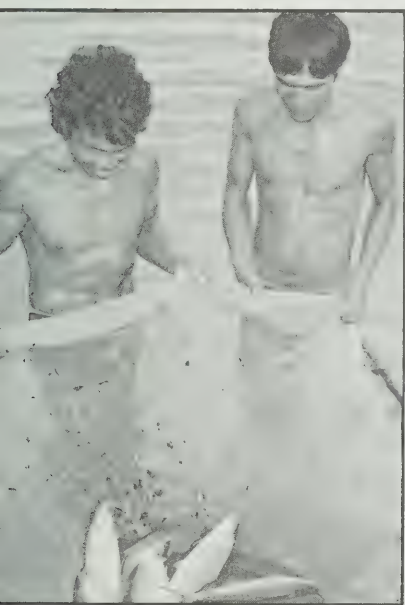
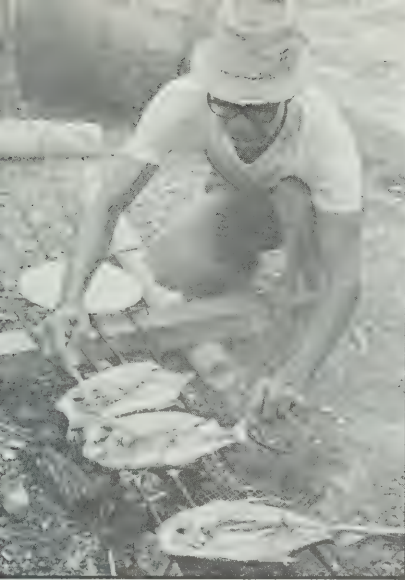
*Agriculture and environment* would like to publish more articles from developing countries and are calling for submissions. Says the journal's editor, T.V.L. Ulbricht of the Agriculture Research Council of Great Britain: "I believe that our journal could play a useful role in directing more thought and attention to the environmental consequences of agricultural development."

Enquiries and manuscripts should be addressed to the Editorial Secretariat, *Agriculture and environment*, P.O. Box 330, 1000 AH Amsterdam, the Netherlands.









As the sun sets over the Gulf of Panay on the western edge of the Philippine archipelago, a dozen small boats set out from shore. Kerosene lamps bob over their decks, the better to attract ever-scarcer fish to the waiting nets.

The waters off Panay Island are among the richest milkfish grounds in the Philippines. Yet the most promising fishing areas may well be a hundred metres away, on shore. These are the headquarters of the Aquaculture Department of the Southeast Asian Fisheries Development Centre (SEAFDEC), at Tigbauan, Iloilo Province.

Milkfish (*Chanos chanos*), the only surviving member of the Chanidae family, were first identified in the Red Sea by Forskal in 1775. And although they are widely distributed in tropical waters from Africa to the Americas, it is only in Southeast Asia — mainly Taiwan, Indonesia, and the Philippines — that the milkfish is extensively farmed.

Known as *bangos*, *bangus*, or *sabalo* in the Philippines, milkfish are the preferred fish of Filipinos and the main aquaculture species. The culture of the silvery blue fish in brackish water ponds was in fact noted by Magellan when he landed on the shores of Cebu some 450 years ago. The reasons, as explained in the 1932 study published in the *Philippines Journal of Science* are: "...the remarkable adaptability of the *bangos* and its acceptable quality for the ember and pot....Rapid of growth, vegetarian, and absolutely non-cannibalistic in habit, prolific by nature, and palatable in flesh, the *bangos* as a pond and food fish is without question one of the best. The availability of the fry or tiny young in numerous quantities during seasons of the year is a very important factor in its favour."

That may well have been true in 1932 but, in the 50 years since, those "numerous quantities" of fry have not been sufficient to meet demand. An estimated 1.3 billion fry are needed annually to stock the close to 160 000 hectares of ponds devoted to milkfish culture in the Philippines alone. Fry collection, using age-old techniques that are highly destructive of other species of aquatic life, yields only 500 million.

As the early researchers noted, although the milkfish is prolific in the

wild: "It is a well established fact that *bangos* do not reach sexual maturity in the fishponds, no matter how large the ponds may be nor how long the fish are kept in captivity." And that became the major stumbling block to the expansion of milkfish cultivation throughout Asia.

In fact, little new information on the milkfish had been obtained since the early 1930s. By 1975, all that was known was the geographical distribution of spawning adults and fry, some indication on the location of spawning grounds, and limited data on the development of suspected milkfish eggs and larvae.

Thus, when SEAFDEC launched a project to develop a technology to improve the production of milkfish, mass scale seed production was planned. But first, a number of basic questions needed to be answered: How and where do you catch a milkfish breeder alive? Having done so, how do you keep it alive? How do you differentiate between males and females, since there are no obvious external characteristics?

SEAFDEC's seed production team started out by capturing wild spawners, but mortality was high. Milkfish are in fact so excitable that capture and handling causes stress that often results in death, sometimes within minutes. A technique for handling and transporting wild *sabalo* had to be developed. By towing the cages to shore and transferring the fish to individual plastic bags carried on a hammock, and carefully releasing the fish in tanks with controlled salinity, a good survival rate was achieved.

The first experiments to induce milkfish to spawn in 1976 met with partial success. Females injected with purified salmon gonadotropin ovulated, but the eggs could not be fertilized since none of the males responded to treatment. In April 1977, however, newspaper headlines throughout the Philippines proclaimed "Bangus is born", "Breakthrough in milkfish culture", and even "Bangus without sex". Indeed, spawning had been induced by injecting hormones, namely acetone-dried powdered salmon pituitary gland and human chorionic gonadotropin. The eggs were fertilized with sperm from induced males, incubated, and hatched.

Because of the expectations it created in Filipino fish farmers, SEAFDEC's

## A SILVER-BLUE REVOLUTION

### MILKFISH FARMING IN ASIA

MICHELLE HIBLER

Facing page: Milkfish, a bounty of protein. Above, top to bottom: Milkfish are the preferred fish of Filipino consumers. Harvesting the crop in experimental ponds. At SEAFDEC, milkfish eggs are washed in preparation for fertilization.





## THE WAY TO HIGHER YIELDS

The People's Republic of China has an estimated 10 million hectares of water being "farmed" to some extent. Thirteen of these hectares are located on the outskirts of Beijing, at the Beijing Aquatic Products Supply and Marketing Corporation, one of 10 state-owned fish farms in the area.

Using induced breeding techniques, the farm produces most of the seed needed to stock its ponds. Eight species of fish are grown in a polyculture system. The fingerlings are released in early March, although the waters are still cold, and are usually harvested in the fall. All the ponds are mechanically oxygenated and a system of small canals carries supplementary feeds — grass clippings, bean mash, wheat and rice bran, and corn — to the ponds.

Disease is not a problem, says Mr Yao Shizhi, the farm's director, because close attention is paid to water quality. Following China's policy of prevention first, disease control medications are also added to the ponds shortly after stocking.

Despite the high yields obtained for a cold region, Mr Yao is not satisfied. "We have gained much experience," he says, "but we must make more improvements." These improvements are brought about by experimentation in two of the farm's ponds. By stocking a greater number of fish of different sizes — ranging from 250 g to 1.5 kg — they have been able to obtain net yields of 20 000 kg/hectare. "There are three ways for us to improve our yields," says Yao, "by educating people, by inviting specialists to come and make suggestions, and by improving our own production techniques."

researchers were somewhat embarrassed by the fanfare — including a presidential citation — that accompanied this "world first" induced breeding of milkfish. Dr Jesus Juario, project leader, cautions that the process remains to be refined and standardized before milkfish farmers reap the benefits.

Standardization of the techniques requires a more abundant and reliable supply of spawners than can be caught by chance in the open sea. Since 1975, therefore, pond-grown juveniles were stocked at the aquaculture department's marine station at Igang, on Guimaras Island, and were being domesticated and raised as broodstock. Spent wild *sabalos* — adult fish who had already spawned — were also kept in cages in the sheltered cove to see if they could be induced to spawn again.

Every week, fish in the induced maturation cages were injected with hormone pellets to stimulate gonadal maturation, but to no avail. Fish in other cages were part of a control group, to see if they would mature naturally. They didn't. Every month, the cage netting of both was changed to prevent fouling and fish were removed for examination.

The researchers began to suspect that this handling was preventing maturation. As Dr Juario explains, even the fish raised from the eggs fertilized in 1977 and now tame enough to eat out of the researchers' hands return to their wild and nervous habits if one of their numbers is handled. They therefore decided to leave some of the fish alone. Six months later, in August 1980, all the fish in the "neglected" cage had matured and the researchers recovered some 1400 eggs outside the cage.

The advantages of spontaneous breeding are obvious: it requires only floating cages that could be established almost anywhere, reducing the need for recirculating and aerated tanks and costly transport of fry. Recovery of the floating eggs is still a problem, however. Various cages have been designed at Tigbauan, but none so far is satisfactory to both the fish and the researchers.

Breeding was only one thrust of the research. Ecological surveys were carried out to locate milkfish spawning grounds. It was known that fry appear along the coast, remain for a few days, and disappear out to sea only to return as spawning adults. Local fishermen suggested to the researchers that Batbatan Island, off the west coast of Panay Island, was a major spawning area. They were right, and, for the first time since 1926, a number of eggs were collected.

The researchers concluded from their surveys that milkfish spawn during the four days before and after a full moon. The eggs hatch in the surface layers of water, the larvae float down and are driven toward shore, carried by waves and currents.

Fishermen also told the researchers that they never captured adult milkfish

— illegal in any case — until "the grass in the villages becomes brown and brittle." SEAFDEC's researchers charted the fish's movements: up the coast at a distance of one to two kilometres from shore during the dry season from April to August, and back again in September. This correlated with increasing, then decreasing, water temperatures, and suggested that milkfish do not spawn in waters colder than 27°C or warmer than 30.6°C.

These studies will enable the researchers to identify the ecological conditions best suited to the fry's survival and growth and for natural spawning of adults.

Techniques of milkfish culture have changed little since Magellan's arrival in 1521. Packed earth forms a dike around a grid of different-sized enclosures — nursery ponds, transition ponds, and growing out ponds. Along the road to the Leganes station, small shallow ponds line the road. During the dry season they are used for evaporating seawater to produce salt. In other seasons, they grow fish. The average yield is 600 kg per hectare annually, while yields of 2000 kg are reported in Taiwan.

At the station, efficient ways of increasing production are being tested. Pond engineering, fertilization, feed production and predator control are all studied. For example, feed trials have indicated that *lablab* — a mixture of algae — is an important natural food for milkfish of all ages. To date, no satisfactory formulated feed has been found. Pond designs incorporating special ponds for growing *lablab* have now been developed. Polyculture experiments have shown that milkfish and prawns can be grown together.

The studies are continuing, building on the successes to date and making further inroads into the mysteries surrounding the life of the milkfish. One of the main problems left to be solved is fry mortality. For every 1000 fry stocked in ponds, only 378 fish are harvested. According to Dr Juario, the first 3-4 weeks are crucial and the low survival rate is the same for fry collected from the wild or bred from spawners — anywhere from 13 to 70 percent.

Boosted by their successes to date, the researchers — many of whom have been able to pursue their training through the IDRC-funded project — are confident they will succeed.

Dr Juario points out that some 1.5 million hectares of tidal flats, swamps, lagoons, and other bodies of water lie idle in the Philippines — waters that could produce both food and employment. The project may be instrumental in fostering the development of these areas.

And despite the caution expressed by the SEAFDEC team — who have become known as the Sabalo Sex Team — some benefits are already being reaped by small farmers in the form of increased credit and financing for aquaculture activities. A silver-blue revolution may be underway. □



# HAND IN HAND

## MANAGEMENT AND RESEARCH

MICHAEL GRAHAM

Research is a risky business at the best of times. Not only does it depend on careful formulation of a research idea, but equally so on efficient management. Lack of sound administration and financial management is increasingly cited, however, as the reason why some projects fail to meet their objectives. Indeed, poor management can result in failure to receive needed equipment, difficulties in budgeting and accounting, delays in recruiting staff, and many other problems.

Proper administration and financial management are of paramount importance to IDRC. Recognizing that administrative and financial procedures are often considered to be an impediment to research rather than an essential support activity, IDRC sponsored two workshops in mid-1981 in Singapore to identify problems and recommend solutions. Part of an IDRC project on the development of financial and administrative capabilities of IDRC-assisted institutions — and the first project to be supported by the Office of the Treasurer and Comptroller General — the two workshops brought together some 48 research and project coordinators and financial officers from nine Asian countries.

The workshops had four major objectives: to establish and encourage a dialogue between scientists and financial administrators; to identify problems in existing financial and administrative procedures; to propose recommendations to allow IDRC to become more responsive to recipients' needs; and to present a mini-accounting and reporting kit designed to help institutions.

There is little doubt that the objectives were successfully met — problems were identified, solutions offered, and frank appraisals made of both donor and recipient systems.

The need for early and continuous interaction between research and financial personnel was emphasized throughout the deliberations. It was recognized that many of the problems in budgeting, staffing, making payments, reporting, etc., could be avoided by developing a habit of early consultation. Nor are the recipient

institutions the only source of problems: IDRC was cited as contributing to difficulties because of apparent inconsistencies in the application of Centre policies between program divisions and, in some cases, because IDRC policy guidelines were not completely understood by grant recipients.

Both workshops therefore pleaded for financial and project officers to communicate more fully. It was suggested that the dialogue should start when the project is being formulated and continue throughout its duration. Not only would this lead to more accurate budgeting and cost accounting, but, equally important, it would free the researchers from administrative tasks, enabling them to devote more time to research.

Many proposals were advanced to solve specific problems. For example, it was suggested that the Centre consider paying a premium to project personnel to compensate for the insecurity associated with short-term research projects, or consider covering the cost of some employment benefits lost because of the nature of contract work. In recognition of the problems caused by delays in receipt of the final payment — the inability to pay salaries or outstanding invoices, or to obtain computer time for data analysis — it was proposed that the project agreements provide either for the recipient institution to cover the costs until the final payment is received, or that IDRC release the payment before the project's final report is submitted.

To counteract the problems in financial reporting resulting from an unawareness or misinterpretation of IDRC requirements, it was proposed that guidelines be issued.

A first step will be the publication of a comprehensive report of both workshops. The state-of-the-art report, to be prepared by a Filipino consultant, will include a synthesis of discussions and conclusions about finance and administration of research projects. The information will be invaluable in devising workable solutions to many institute-specific problems identified during the two workshops.

It is essential that IDRC Treasury and

the Centre as a whole better understand the institutions with which they deal. Plans are therefore under way to compile detailed profiles of recipient institutions and to evaluate their financial systems. This information will assist IDRC staff involved in project development and monitoring to establish the most appropriate contacts.

And while it was the workshops' delegates who proposed and endorsed the preparation of the profiles, they also requested that IDRC clearly explain its own system and requirements. Further dissemination of the booklet, *Project budgeting and administration: a guide to IDRC's financial procedures*, was called for, and it was requested that it be expanded to include a checklist of specific items to be considered when preparing a project proposal, examples of details, and guidelines on budgeting, accounting, and reporting.

The accounting and reporting kit previewed during the meetings was well received and the participants encouraged IDRC to promote its use by researchers with limited accounting experience.

The success of these workshops led to a proposal that similar meetings be held, bringing together government officials, umbrella organizations responsible for country-wide allocation of research funds, customs officials, government auditors, and banking representatives, to discuss problems and solutions in a national context. Such national meetings would also allow researchers and financial officers from a number of institutes to compare their experiences and methods. The Philippines are planning to hold such a meeting early in 1982, and tentative plans are being made for similar workshops in Thailand and Indonesia.

Thus, the dialogue initiated in Singapore will continue. The greater understanding that will result between scientists and finance officers should ensure cooperation between them and should ultimately increase the likelihood of success of future research projects. □

Michael Graham is Communications Liaison Officer in IDRC's Singapore Office.



# FERTILIZER'S ROCKY ROAD

JACQUELINE A. ASHBY

When Humberto García, a small farmer in Colombia, went to buy the fertilizer that he was planning to use for planting in the wet season of 1980, the fertilizer distributors in the nearby market town had run out of the product he usually applies. One fertilizer dealer did have a newly arrived product, *fosforita huila*, or ground phosphate rock from the nearby Huila phosphate mine. Since this new product was cheaper than the alternative fertilizers, Humberto García took two bags back to his farm to try.

Humberto García got a pleasant surprise. His crops grew well, and it had cost him only about one-half of what he normally spends on this kind of fertilizer. In the near future, researchers expect to remove the surprise — but keep the low-cost gains — for smallholders using phosphate fertilizers in Latin America.

In July 1977, IDRC provided financial support to assist the International Fertilizer Development Centre (IFDC), based in Muscle Shoals, Alabama (U.S.A.), in developing a phosphate strategy for the acid infertile soils of tropical Latin America. The International Centre for Tropical Agriculture (CIAT) was interested in joining IFDC in conducting the phosphorus studies.





The timing seemed to be right for such a study. Growth in agricultural output in the Latin American countries in the past two decades has depended to a large extent on increased use of fertilizer. In Colombia, for example, consumption of phosphate fertilizer had increased about 300 percent in that period. Fertilizer prices were high and projected to be higher. An estimated one billion hectares in Latin America having some potential commercial value are deficient in phosphorus.

At the same time, new rock phosphate deposits for exploitation were being discovered, including some 20 deposits in several countries of tropical Latin America. The potentially lower price of locally produced phosphate rock would expand the possibilities for increased use of fertilizer in food production on phosphorus-deficient soils. In Colombia, for example, Huila phosphate rock retails at U.S. \$109 per tonne compared with the most widely used complex fertilizer at U.S. \$420 per tonne. Since many staple food crops in Latin America are produced on small farms, and almost all Latin American countries are net importers of food staples, the availability of lower cost phosphate fertilizers should benefit both small-scale producers and urban consumers in Latin America. This potential for improvement exists in both food crop production and pasture for beef and dairy production, important contributors to the diet of Latin America's rapidly increasing urban population.

But the usefulness of rock phosphates is not limited to Latin America. "Essentially anywhere you have high rainfall conditions, where leaching of the soil has taken place over time, you get a tendency for the base (nonacid) elements to be leached out. The soils tend to become acidic and infertile, and there rock phosphate has great potential for restoring a measure of fertility at a low cost," says Dr William D. Bishop, Director of IFDC's Agro-Economic Division. "If you are looking at the importance of a particular nutrient to production in a region, then phosphorus in Latin America is an absolute must. It's critical," says Dr Bishop.

Most of the phosphate fertilizers used today are derived from phosphate rock, but are expensive because of the costly commercial processes that are used to increase solubility. This increased solubility makes it possible for a high percentage of the phosphorus contained in the fertilizer to be immediately dissolved by soil moisture and, therefore, be immediately available to the crops being fertilized. Although acid soils are normally considered a detriment to optimum crop production, it was felt that the high acidity present in the majority of Latin American soils could be taken advantage of by using the soil

itself to dissolve locally available phosphate rock rather than increasing solubility through a commercial process.

While direct application of finely ground phosphate rock has been practiced in many countries throughout the years, little was known in 1977 about the suitability of the phosphate-containing rocks located in Latin America.

If rock phosphate is to have a benefit, says Dr Bishop, all the various production factors must be taken into consideration. "You have to know what the phosphorus content of the local rock is. Just like any other ore, rock phosphate can contain low or high concentrations of what you want as the end product. You need to know what crops you will be applying it on, under what sort of soil conditions you are working. And you have to know what crop response there will be, because if the crop doesn't respond well to the particular type of phosphate, I don't care if rock phosphate is cheaper, it's still not a good buy for the farmer."

The effectiveness of phosphate rock as a fertilizer varies according to the extent of solubility or "reactivity" of the part of the rock containing the phosphorus. Phosphate rocks from the various newly discovered deposits in Latin America vary in chemical composition. Some are more soluble than others. Therefore, the first tasks of the researchers were to determine the solubility of these various phosphate rock sources and to investigate how each one reacts in different types of soil.

Dramatic yield increases are common with most crops when more soluble forms of conventional phosphate fertilizers are used on many soils of tropical Latin America. The project's research on various types of these soils has also shown promising results with the use of finely ground phosphate rock for a number of soil-crop combinations, using a total of 12 different rock sources from Latin America.

The residual availability of phosphorus from phosphate rock and other phosphate fertilizers has also been evaluated in the project. Results show that commercially processed fertilizers make large amounts of phosphorus available to the plant over the short term, but because of the continuous process of dissolving in the soil, the phosphate rock provides an excellent source of long-term available phosphorus. This characteristic is especially important for pasture production, and phosphate rock can now be recommended without reservation for upgrading vast areas of low-quality grazing land in Latin America.

The project's research also shows that phosphate rock is effective on many acid soils for crops with a higher phosphorus requirement than pasture grasses, such as beans, cassava, and rice. Fertilization of annual crops with relatively high rates of phosphate rock could even be followed by establishment of pasture grasses to use the residual phosphorus without a reapplication.

Field experiments are also investigating factors such as the effectiveness of phosphate rock on crops or pastures when it is combined with a more soluble phosphate fertilizer. The findings indicate that it is possible for farmers to reduce the cost of correcting a phosphorus deficiency by substituting the cheaper phosphate rock for some proportion of the expensive soluble phosphate fertilizer.

The research is testing a variety of flexible strategies for managing locally available phosphate rock sources alone and in combination with other phosphate sources. The results will provide a comprehensive guide to the utilization of potential phosphate sources, soil, crop, and management combinations in which phosphate rock presents an effective alternative to higher-cost soluble phosphates in the acid infertile soils of Latin America.

## NEW DIRECTIONS

Agronomic studies in the phosphorus project have provided basic information on the agronomic potential of indigenous phosphate rock in the acid soils of tropical Latin America, information that was lacking when the project began in 1977. In order to transfer these promising experimental station results to national extension programs and to farmers like Humberto García, some additional questions must be answered.

How effective will phosphate rock fertilizers be when support fertilization, weed and insect control, or irrigation are managed under the constraints faced by farmers? Substitution of phosphate rock products for conventional phosphorus sources, mixtures of the two, or modified phosphate ores are expected to reduce costs, but the economic information that fertilizer producers and farmers need in order to choose from these possibilities has yet to be tabulated.

Differences in the physical and chemical properties of phosphate rock indicate that farmers may have to change their customary methods of handling and applying fertilizer when they use phosphate rock. The implications of these changes for fertilizer management in different cropping systems in Latin America and their acceptability to farmers must still be evaluated.

With research addressing these questions, it will be possible to make recommendations to fertilizer producers, to national extension programs, and to farmers about how they can best realize the agronomic potential that the project's research has identified for new phosphate rock products.

"One of the things we expect from a cheap, local, effective source of phosphate is an increased demand for the fertilizer. And from that demand and increased use, you would create an increased supply of food," says Dr Bishop. □

Jacqueline A. Ashby is a rural sociologist in the Agro-Economic Division of IFDC.

*Photos opposite page Top: Cowpeas respond to the application of rock phosphate in an experimental plot. Bottom: A newly-opened rock phosphate grinding facility in Colombia: putting it back in the ground for better yields.*



# STANDING FAST

## AGAINST THE DESERT

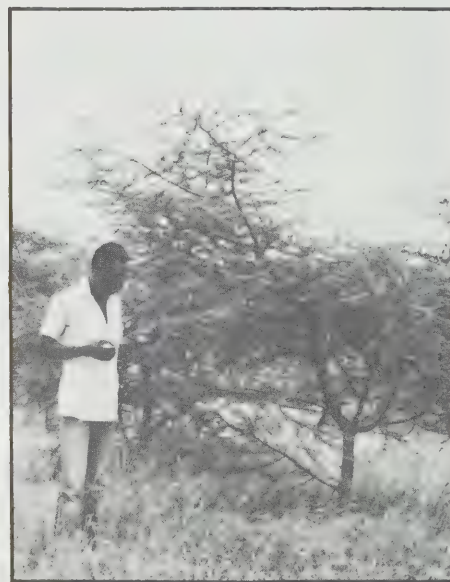
JEAN-MARC FLEURY



**M**biddi. When this small isolated hamlet of some 50 people in the North of Senegal is invaded during the dry season by thousands of cattle, the huts disappear behind the dust. The herders — Senegal's cowboys — know that here they will be able to water their herds. The well at Mbiddi is 250 metres deep and never dry.

The animals come for water, but the inhabitants stay because of the forestry station. "If it wasn't for the research station," says Oumar Tandia, technician with Senegal's Directorate of Water and Forests, "the drought would have emptied the village." Forestry work employs many heads of households.

In this region, typical of the Sahel, a good year will bring from 250 to 300 mm of erratic rains. El Hadji Sène, Director of Water and Forests, calls it "mosaic rain." "It rains enough to grow the crops in one village, yet in another barely 30 km away, there isn't a drop," he says. It is for this reason that many



deep wells have been bored. There are now more than 70 throughout Senegal's rangelands, spaced about 30 to 40 km from each other.

The environment around the boreholes suffers from the regular onslaught of large numbers of animals: some are more affected than others as brush fires and mosaic rains drive the animals toward certain sites. Between October and June, the leaves on the trees are the only green forage available. Toward the end of the dry season, leaves and edible pods make up about half the diet of the region's goats, camels, and cattle. The ligneous (woody) cover near the water holes is subjected to extremely intensive grazing.

The drought that came in 1972 delivered the final blow. The water table fell, slipping away under the roots. Over-exploitation coupled with the drought to destroy 20 to 80 percent of the ligneous

*Left: An Acacia tortilis at first fruiting. The pods may be the only forage available during the dry season in northern Senegal. Above: A researcher examines an acacia in Mbiddi. The trees may become the centrepiece of a strategy for economic and environmental survival in the Sahel.*



cover, particularly around water holes.

The disappearance of the trees deprived the animals of the much-needed "aerial pastures." The nomadic herders also lost an important source of revenue. One of the trees, the *Acacia senegal*, secretes gum arabic, a precious hydrocolloid used as an emolient and binding agent in pharmaceuticals and food. Each year, beginning in November, the Peul and Moor herders strip bark from the trees to promote the exudation of balls of gum. The harvest continues until February, some trees producing many kilograms of gum. The nomads earn 150-200 francs CFA per kilogram (\$ 1 Can. equals about 225 francs CFA) and Senegal has traditionally been one of the main exporters of gum arabic.

The drought caused exports to plummet from 6000 tonnes in 1971 to 500 tonnes in 1972. And because the trees were destroyed, Senegal's production has remained at 500 to 1000 tonnes a year.

Many of the Sahel's inhabitants left the stricken area. Yet, for centuries, cattleraising had provided a living for the Sahelians. The Sahel's grass cover and aerial pastures can feed large herds, at a density of one head of cattle per 4.5 hectares.

Because of the importance of cattleraising to the area, Senegal's forestry authorities decided to wage war against the desert. Reforestation, especially around water holes, became a priority in order to promote a better-planned development of the cattle industry and encourage the settlement of nomadic herders. Before large-scale reforestation was begun, however, the most productive gum and forage trees had to be identified and reforestation techniques developed.

Some research on gum and forage producing acacias had already been carried out in Senegal and elsewhere, but without follow-up. "It was back to square one," says El Hadji Sène. In 1972 discussions were undertaken with IDRC, which supported a research project on the reforestation of rangelands.

The Senegalese researchers and engineers have now succeeded in establishing an impressive collection of ligneous plant material at Mbiddi. The experimental plantations total 340 hectares, 75 of which are planted to gum trees, the rest to forage trees.

Planted in 1974, the gum trees stand proud — even though a mature *Acacia senegal* tree only grows to 2-5 metres. The survival rate has remained at 85 to 95 percent despite extremely difficult years. In 1976, for example, an army of rats gnawed all the young trees. The next year, the drought returned with a vengeance. Although only 130 mm of rain fell, the acacias survived nevertheless.

Thanks to the techniques developed at Mbiddi (see box), Senegal has reforested more than half-a-dozen water holes and settlement sites. Since 1975, 3000 hectares of gum trees have been planted, to which 2000 more will have been added in 1981. The cost per hectare, some 100 000 francs CFA, is too high to

permit the reforestation of the region's 80 000 km<sup>2</sup>, however. To reduce this cost, Mr Sène is relying on the participation of communities who quickly realize the advantages to be gained from gum orchards. In one department, for example, the Directorate planned to establish 600 hectares of community plantations in 1981. "They told us that 600 hectares was good, but 1000 would be a lot better," says El Hadji Sène. "We gave them the green light, and true to their

## TO PLANT A TREE

The Mbiddi researchers recommend the following procedures for planting trees, particularly acacias, in arid regions:†

Seeds, soaked for 12-24 hours in a small volume of hot water, are planted in polyethylene bags and germinated in the nursery. Planting should be done at the onset of the rainy season, before the seedlings become too large for transplanting.

Breaking up the soil with a subsoiler before planting has given excellent results at Mbiddi and is strongly recommended. The seedlings are then planted at the intersection of two rows: the bags are cut and removed, the tree is planted and watered. The area around the young tree must be kept completely free of other vegetation for the first 2-3 years.

According to the researchers, trees should be planted no closer than 6 metres from one another and the soil close to the tree should be banked to retain rainwater and catch any runoff.

† *Techniques de reboisement dans les zones subdésertiques d'Afrique*, by G.R. Ferlin (IDRC-169f).

word, when we carried out an inventory in this community, we counted 1018 reforested hectares," he adds.

Even if it takes seven years for the *Acacia senegal* to produce its maximum yields, the local people are anxious to have their own plantations. The future of gum arabic seems assured. "Its undeniable advantage is that it's a natural product," says one of the Directorate's engineers. New uses are constantly being found for the gum. One is the manufacture of timed release medications: The tablets are coated alternately with drug and gum; each time a layer of gum dissolves, the tablet delivers a dose of medication. The gum is also used in the same way in the manufacture of multi-stage fireworks.

Research on the forage trees confirmed the remarkable drought-resistance of the indigenous species. The *Acacia tortilis*, *nilotica*, and *senegal* displayed a surprising vigour, growing 60 to 70 cm a year. The species import-

ed from Australia, however, were disappointing. For no apparent reason, the *Acacia holosericeae* and *tumida* grew vigorously in the beginning, but withered suddenly after two or three years. The researchers have consoled themselves with the fact that the second and third generations — trees obtained from seed of trees grown in Senegal — seem more resistant. But if the luxurious Australian acacias suffer under the difficult Sahelian conditions, two species, *Acacia linarioides* and *pyrifolia*, seem hardier. One thing is certain: As soon as the new forage trees are available, they will need to prove their hardiness. Cattle and goats that have tasted the Australians' leaves didn't leave so much as a twig or stem behind them.

The solution to the adaptation problems of exotic acacia species could come from biotechnology. A young researcher at the National Centre for Forestry Research, Ibrahima Guèye, has just returned from Canada where he completed a masters' degree in plant symbiosis. At the University of Laval in Quebec, he studied the bacteria and fungi that promote the growth of acacias.

*Rhizobium* bacteria colonize the roots of leguminous plants such as acacia, enabling them to fix and use atmospheric nitrogen. In the same way, microscopic fungi of the phycmycete class, *mycorrhizae*, help the plants to assimilate phosphorus, the most important nutrient after nitrogen. "Tropical soils in West Africa are often rich in phosphorus," says Ibrahima Guèye, "but often in a form of phosphate that plants can't assimilate." The mycorrhizae transform the phosphate into a form usable by the plants. And so, in tropical countries, it is essential to inoculate orange trees and pine with mycorrhizal fungi to ensure their survival in plantations. In addition, the mycorrhizae increase the plant's resistance to drought because they also extend the root system beyond the root hairs, increasing the roots' water absorption capacity.

Both rhizobium and mycorrhizae are found on the roots of *Acacia senegal* and *tortilis*. The researchers hope to identify strains that will double the trees' initial growth rate in the nursery. These biological helpers will assist the trees to produce more protein-rich foliage and may also broaden the range of tree species that could be introduced in the Sahel's rangelands.

If the research seems increasingly specialized, the researchers have not forgotten the users. "Mbiddi will only reach its objective if we can translate the results into tools for the people of the region," says El Hadji Sène. And, in fact, some pioneering peasants have already started to plant gum trees from Mbiddi's nursery.

The research station each year distributes a growing number of kilograms of seed collected from the most promising candidates. Mbiddi may well become the ancestral home on the range of the Sahel's future orchards of gum and forage trees. □



# FOOD AND POPULATION

## THE UNEQUAL EQUATION

NORMAN E. BORLAUG,  
R. GLENN ANDERSON,  
AND ERNEST W. SPRAGUE

If one is involved in food production, it naturally follows that one must be concerned about the land base upon which we depend for food and about the number of people that land base must feed, since 98 percent of the worldwide tonnage of food in 1975 was produced on the land. Anyone engaged in attempting to increase world food production soon comes to realize that the human misery resulting from food shortages, poverty, and world population growth are all parts of the same problem.

Growing populations demand more land, not only for food production but for other purposes as well. Moreover, soaring food requirements have led to excessive pressures on the land, and many of the techniques used by man to produce food, such as irrigation without drainage, terracing, fallow rotations, and shifting slash-and-burn cultivation are beginning to break down as population numbers force intensification of agriculture on existing cropland.

Unless food production and population growth rates are brought into better balance within the next several decades, the world will become increasingly chaotic. The poverty in many of the developing nations, already serious, will become unbearable. There is also the likelihood that standards of living in some of the affluent nations will stagnate or even, in some cases, retrogress.

Unfortunately, even in privileged, affluent, well-educated nations there has been more concern with symptoms of the complex malaise that threatens civilization than with the basic underlying causes.

We believe that this

approach will not solve the underlying problem. We must not be afraid or unwilling to recognize, confront, and effectively struggle with the primary underlying cause — the human population monster — which adversely affects many facets of life. The longer we wait before attacking the primary cause of this complex worldwide problem with a serious, intelligent, unemotional, effective, and humane approach, the greater will be the deterioration of the quality of life and the fewer of our present species of fauna and flora will survive.

Evidence indicates man or "near man" has been roaming the Earth for at least three million years. About 12 000 years ago humans discovered agriculture. World population then is estimated to have been approximately 15 million. With a stable food supply, population doubled four times to arrive at about 250 million by the time of Christ. Since that time, the first doubling — to 500 million — occurred by 1650. The second doubling required only 200 years. That was about the time of the discovery of the nature and cause of infectious diseases and the dawn of modern medicine, which soon began to reduce the death rate. The third doubling — to two billion — occurred in 1930, only 80 years after the second doubling. Then sulfa drugs, antibiotics, and improved vaccines were discovered, which again reduced death rates spectacularly. World population doubled again — to four billion people — in 1975.

It is obvious that the arable land/food/population ratio and the quality of life is worsening dramatically as the numbers of humans



increase. There are ominous signs that during the next several decades the world will face a worsening shortage of cropland on which to produce its food. In many densely populated countries there is little additional land suitable for agriculture that can be brought under cultivation. In fact, worldwide, there is probably more cropland being removed from agriculture each year than is being added. Expanding cities are expected to cover 25 million hectares of cropland by the end of this century. Although the loss represents only two percent of the current cropland under cultivation, the percentage of food production involved is likely to be substantially greater because cities are commonly built on the most fertile land. Moreover, much additional cropland is being lost because of deforestation, erosion, and desertification.

Growing problems in irrigated lands, which produce a disproportionately large share of the world's food supply, are extremely serious. In some key producing areas the diversion of irrigation water to non-farm uses is reducing potential food production. Although over half of the world's irrigation capacity — particularly in the developing world — has been developed during the last 25 years, waterlogging and salinity resulting from lack of provision for drainage are already impairing yields on millions of hectares. According to a recent UN survey, at least 20 percent of the world's croplands are losing topsoil or being otherwise degraded. These pressures are working to restrict growth in per capita cereal production today, and they

will be at least as strong, if not stronger, during the next 40 years.

As we look at the magnitude of the world food needs for the next half century, we are apprehensive. In 1975, when world population reached four billion, the world produced an all-time record harvest of approximately 3.3 billion metric tons of all kinds of food. It took some 12 000 years to gradually increase production to this record level. If human population growth continues at the same level as prevailed in 1975, population will double to eight billion in about 40 years. Consequently, food production must be doubled in the same period.

There is evidence that population growth is beginning to slow somewhat. But even if we assume that this reduced rate of growth will prevail, the necessary food production increases are staggering. In essence, these projections mean that within the next 40, 60, or 80 years — depending on how population growth changes — world food production must again be increased by at least as much as was achieved during the 12 000 years prior to 1975, just to maintain per capita food production at the inadequate 1975 level.

Can the production of food and fibre be doubled in the next 40 to 80 years? We are cautiously optimistic and believe it can, providing world governments give high enough priority and continuing support to agriculture and forestry. It cannot be achieved with the miserly and discontinuous support that has been given during the past 50 years. If disaster is to be averted, much of the

additional production in the next several decades must come from increased yields on land now under cultivation in Third World nations, where yields are still low.

There are no cheap technological fixes available for solving the food production and security problems facing developing countries in the years ahead. It will take massive investments — particularly in irrigation, drainage, reforestation, soil conservation, and flood control projects, in fertilizer production facilities, in agricultural credit, and in better marketing infrastructures. We must train more and better agricultural scientists, expand our scientific knowledge, and improve and apply better technology if we are to make our finite land and water resources more productive. This must be done promptly and in an orderly way if we are to meet growing needs without, at the same time, unnecessarily degrading the environment and crowding many species into extinction.

Producing more food and fibre and protecting the environment can, at best, be only a holding operation while the population monster is being tamed. Moreover, we must recognize that in the transition period, unless we succeed in increasing the production of basic necessities and more equitably distributing the benefits to meet growing human needs, the world will become more and more chaotic and social and political systems will collapse.

The attainment of human rights in the fullest sense can never be achieved as long as hundreds of millions of poverty-stricken people lack the necessities

of life. Our work has brought us into close contact with such people, and we believe that all who are born into the world have the moral right to the basic ingredients for a decent, humane life. How many should be born and how fast they should come on stage is another matter. This latter question requires the best thinking and efforts of all of us if, in our opinion, we are to survive and leave a world in which our children and their children will want to live and, more important, be able to live.

Those of us who work on the food production front have the moral obligation to warn the political, religious, and educational leaders of the world of the magnitude and seriousness of the arable land/food/population problem that looms ahead. If we fail to do so in a forthright unemotional manner we will be negligent in our duty, and inadvertently, through our irresponsibility, we will contribute to the pending chaos. We are convinced that the amelioration and eventual solution of this complex problem is of the highest urgency. The imminence of disaster is before us. It is closer than most people realize, or are prepared to admit. □

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*Norman E. Borlaug, former director of the Wheat Program at the International Centre for the Improvement of Maize and Wheat (CIMMYT) in Mexico, is currently Associate Director, Agricultural Sciences, at the Rockefeller Foundation. R. Glenn Anderson and Ernest W. Sprague are Director, CIMMYT Wheat Program, and Director, CIMMYT Maize Program, respectively. This article is a shortened version of The human population monster, published by CIMMYT (Apartado Postal 6-641, Mexico 6, D.F., Mexico).*



*There is a growing demand  
for males to share the responsibility and the risks*

# THE MANLY ART OF CONTRACEPTION

ROWAN SHIRKIE

**P**opulation growth in developing countries continues to exert pressure on resources, slowing economic and social development. Yet although surveys indicate that more than half the women of reproductive age want no more children, typically two-thirds do not use any method of fertility control.

Coupled with the need to contain population growth rates is a growing demand for males to share the responsibility and the risks of birth control. Women assume all the health risks of childbearing as well as almost all the risks of adequate contraception, and are becoming increasingly dissatisfied with that role.

Still, more than 70 percent of research funds are paid out in seeking new contraceptive methods for women, and only six percent are earmarked for new male methods. The remainder is applied to finding technologies applicable to both male and female reproductive systems, such as hormonal releasing factors.

One of the constraints to developing new male methods lies in the lack of understanding of the male reproductive system. Relative to research into female systems, the state of knowledge about the male system has advanced little since the discovery that sperm were more than parasites.

Halting male fertility is biologically difficult. Up to a billion sperm are produced daily, and controlling or stopping this proliferation is more difficult than intervening in the female system to regulate a once-a-month ovulation involving only one egg. The genetic material in sperm is also more susceptible to damage, particularly since any method of control must be powerful enough to totally prevent or impair function — sperm reductions of 80-90 percent are not sufficient to guarantee infertility.

The three approaches presently taken in male contraception entail stopping sperm production, blocking sperm transport at the time of intercourse, or altering the quality or capacity of sperm to fertilize. All the methods now actually

in use are based on physically blocking sperm from entering the female reproductive system — vasectomy, condoms, or withdrawal before ejaculation.

The goal of new male contraceptive research is to develop an effective, reversible, easily used method that neither interferes with libido nor the act of intercourse, and is free of any dangerous side effects. For developing countries, two additional characteristics are essential — the method must be inexpensive and easily distributed.

## THE PAST

Withdrawal before ejaculation of sperm is probably the most ancient of male contraceptive methods. However, it is also the least reliable.

The condom evolved from the failures of withdrawal to adequately reduce unplanned pregnancies or provide protection against venereal disease. But although it effectively raises a barrier against fertilization, its effectiveness depends on timing and correct technique in putting on the condom. Concern over the health risk of the pill and IUDs coupled with the renewed epidemic levels of

sexually transmitted diseases (see *Reports* 10(3), October 1981) has nevertheless resulted in increased use of condoms.

Vasectomy — male sterilization involving severing or blocking the *vas deferens* tubes that carry semen from the testes to the penis — has become an important part of contraceptive programs in many countries. In a sense, sterilization is the choice of last resort, since the procedure is not easily reversible and there are indications that men (and women) would prefer to exercise choice over *when* they have children rather than *whether*.

IDRC is currently supporting an investigation into a possible link between vasectomy and arterial disease. Sperm production is not halted by vasectomy, but since their normal outlet is blocked, new mechanisms for disposal of the sperm are brought into play. Sperm can cross the blood-testis barrier to enter the bloodstream, where they trigger production of antibodies. Animal studies suggest that the build-up of antibody complexes damages artery walls and promotes the sort of harden-





ing and thickening usually associated with age and coronary artery disease. Research funded by IDRC will attempt to determine whether the same effects are produced in human males who have undergone vasectomies.

New research seeks the "male pill", a simple, self-administered, reversible contraceptive. As with egg production in women, sperm production in men is regulated by hormones, and most interest is focused on regulating hormone levels to induce infertility by halting sperm production.

In both men and women, a hormone produced in the hypothalamus region in the back of the brain appears to be the master control of reproductive functions. The luteinizing hormone-releasing factor (LHRF) gets its name from its function: it regulates the production and release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), pituitary hormones known as gonadotropins. The gonadotropins' most important effects in men are on the testes: LH stimulates the Leydig cells to produce testosterone and the other steroids that maintain libido and secondary male sexual characteristics, such as deeper voices, musculature, etc.; FSH stimulates the Sertoli cells in the bundled

seminiferous tubules to start producing sperm.

One approach to male contraception attempts to duplicate the action of female oral contraceptive pills containing steroids. Administering male hormones or synthetic hormone analogues acts on the brain and pituitary to decrease gonadotropic hormone levels and inhibit sperm production. In effect, a false signal is given that the testes are over-producing sperm and hormones, and the natural controls are turned down to levels that cause sperm production to stop.

Direct administration of testosterone, the male sex hormone, has been shown to sharply reduce sperm production as a result of this feedback mechanism to the pituitary. But side effects such as weight gain, acne, breast development, and lowered libido weigh against its use.

As testosterone is inactivated when taken by mouth, dosages must be injected regularly, making the regime valuable only for "an exceedingly dedicated subject," as Dr Keith Smith of the University of Texas Medical School notes. Smith, reporting on the first major clinical trials of testosterone, adds, "I do not feel that I could follow this schedule myself of administering a shot in the buttock every 10 days."

Using other steroids to suppress sperm production, with smaller doses of testosterone to maintain libido and secondary male physical characteris-

tics, has so far produced mixed results. The approach has not consistently produced low enough sperm counts.

There are serious concerns about possible genetic damage by these chemicals. Sperm continuously develop from cells in the testes. If any of the genetic complements of the cells are damaged, the resulting sperm could also be affected. Should conception occur, the genetic message of damaged sperm could be translated into deformed fetuses and carried on to other generations.

The search for non-steroid contraceptives has taken researchers back to the brain. The master control LHRF, although it is hormonally active, has a different chemical structure than the steroids. It is a chain of linked amino acids with the same basic molecular structure as a protein — a polypeptide. Peptides are known to have more specialized and specific sites of action in the body, and are shorter-lived than steroids.

But LHRF is too weak naturally to be used as a contraceptive. Uncovering its structure made possible the synthesis of analogues — substances with similar characteristics, but in which desirable properties could be strengthened. A variety of analogues have been investigated: agonists, which imitate natural LHRF; antagonists, which block its action; and selective agonists, which duplicate only some functions of LHRF. Some 1000 analogues have been created.

*The risks associated with other methods of contraception have revived the popularity of condoms, being sold in Thailand, facing page. Below: Researchers in Chile carry out work on sperm inhibition.*





The most extensive trials have involved one analogue, a super agonist which is about 144 times more powerful than LHRF. However, instead of accelerating hormone production, the super agonist paradoxically inhibits reproductive functions by overstimulating the pituitary, thus exhausting its capacity to respond further and produce LH and FSH sufficient to maintain sperm production.

Dr David Rabin, who directed the super agonist LHRF study at Vanderbilt University in Nashville, U.S.A., reported that sperm production dropped by 75-100 percent. All subjects recovered fertility within 10-14 weeks after administration of the super agonist was stopped. He noted, however, that in some subjects the regime of daily injections reduced testosterone levels and had side effects: impotency, reduced libido, and "hot flashes" — momentary increases of body temperature.

Effective, reversible, and safe, synthetic LHRF shows promise as a male contraceptive. The annoying — but not dangerous — side effects must still be eliminated, and a more convenient mechanism than daily injections developed.

#### GOSSYPOL

The closest researchers have yet come to a male pill appears to be work under way in the Peoples' Republic of China on gossypol — a compound found in the seed, stem, and roots of the cotton plant.

An investigation of high rates of infertility in a province of China eventually linked them to the local use of crude cotton seed oil for cooking. Gossypol

was identified as the active agent.

Clinical trials of a gossypol pill began in 1972, and about 10 000 men have been studied. Results are reported in the *Chinese Medical Journal* as 99.89 percent effective, and side effects as "mild and of low incidence."

Gossypol is known to be toxic when eaten regularly, however, and also tends to accumulate in the body, leading to concern over long-term health effects. About three-quarters of one percent of its male users developed a paralysis caused by potassium deficiency.

Gossypol apparently works by inhibiting an enzyme that is vital to the metabolism of sperm and sperm-generating cells. As it does not act on sex hormone levels or impair libido, expectations are high that gossypol may be the first of the new male contraceptives to become widely accepted. But along with the sperm enzymes, gossypol also inhibits other enzymatic activity in the body — including some that function to detoxify organic compounds, a few of which are linked to cancer.

Sperm in the testes are immature, incapable of either fertilization or movement. They gain these capabilities as they develop in the epididymis, the set of long cordlike ducts that lies immediately behind the testes. Little is known about the biochemical changes that occur as sperm pass through the epididymis, except that certain chemicals — like gossypol — can interrupt or inhibit the maturing process.

Researchers in Thailand, with IDRC funding, are attempting to characterize the biochemical processes that take place as sperm mature. The work of Dr Montri Chulavatnol and colleagues in

the biochemistry department of Mahidol University may open the way for sophisticated techniques of modifying the process as a means of contraception. Dr Chulavatnol is examining the mechanism that enables sperm to convert chemical energy stored in cells and transmit and use it as mechanical energy, powering the sperm's flagellum or tail as it swims towards the egg after ejaculation into the female. Preventing the formation of the particular compound that is the energy source, or preventing its use once formed, could be the key to a male contraceptive that poses little risk of genetic damage or of producing side effects on a larger scale within the body system.

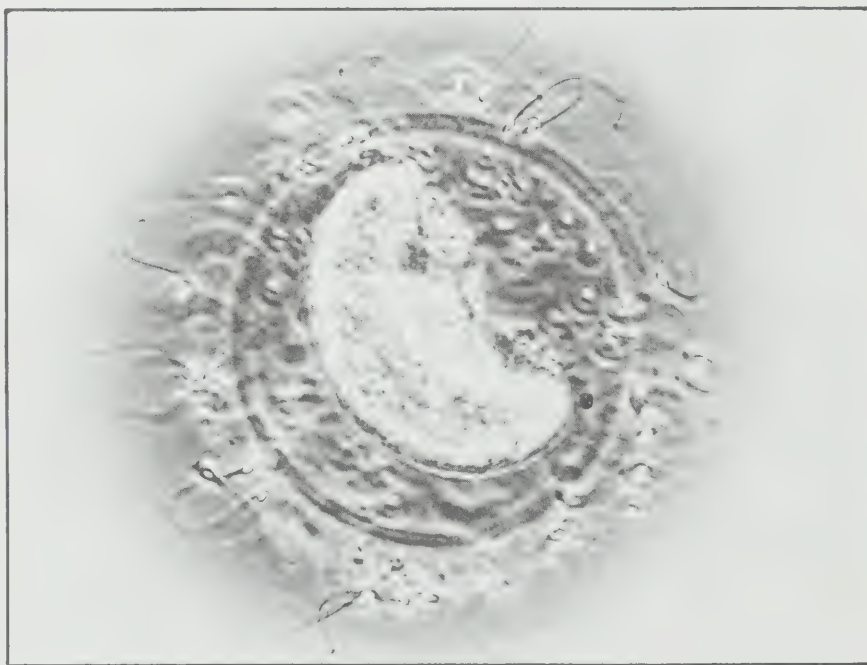
A still more finely targeted approach, again supported by IDRC, aims at providing contraception precisely at the point where sperm and ovum meet.

It focuses on two enzymes that play a part in the penetration of sperm through the layers that surround the ovum. Hyaluronidase allows sperm transport through the cumulus, an outer layer, and acrosin is needed for penetration of the zona pellucida, the inner layer. Dr Horacio Croxatto, of Chile's Centro Nacional de la Familia in Santiago, and Dr John Elce at the Department of Biochemistry of Queen's University in Kingston, Canada, are carrying out work that could potentially lead to a male contraceptive vaccine. The presence of antibodies to sperm has been noted in men with vasectomies. There is also evidence that suggests some cases of infertility may be due to the immunological response of women to sperm.

Drs Croxatto and Elce speculate that if the two particular enzymes, hyaluronidase and acrosin, could be isolated and sufficiently purified, they could perhaps be used to provoke a specific immune response against them. Having achieved the response, the specific antibodies to hyaluronidase and acrosin could then be isolated, purified, and manufactured as a vaccine.

The vaccine approach is elegantly simple. It would have only one effect — sperm would be unable to penetrate ova. In this case, the side effect would be infertility. But one of the principal advantages of the vaccine may also be a drawback. As a vaccine, perhaps only one injection, or one and a series of boosters every few years, would be necessary to confer infertility. But, having turned on the body's defenses against sperm, how will the antibodies be suppressed again when a user wishes to have children?

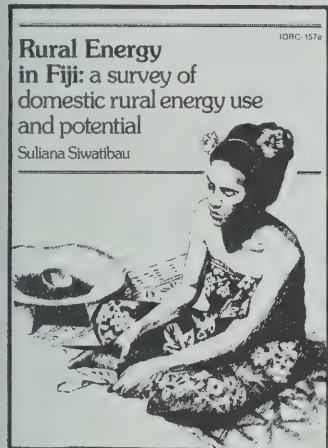
There are many questions concerning male contraception that must be answered through research before the goal of an effective, reversible, safe, and inexpensive technology is realized. Males are unlikely to accept a contraceptive technology that is less than perfect. And without men assuming more responsibility for family planning, the greater goal of balancing world population with resources seems ever more remote. □



Spermatozoa are attached to the outer layer of the ovum, but are unable to penetrate and fertilize it due to the inhibition of two important sperm enzymes. Some of the chemical components of sperm are identified as foreign infections and trigger an immune response in the body. Researchers are attempting to duplicate and enhance the action to create a vaccine that would give "immunity" to fertilization by increasing resistance to two sperm enzymes, acrosin and hyaluronidase.



## Publications



**Beyond Manila, Philippine rural problems in perspective.** *Gelia T. Castillo. Published in September 1979, 420 pages, IDRC-116e.*

Described by the author as a "modest response to a very appropriate challenge," that of examining and interpreting social science in the Philippines, this monograph aims to present a research-based picture of Philippine rural problems with a rural-urban perspective and a regional dimension. Produced with the assistance of an IDRC Research Fellowship, it outlines patterns of poverty, inequality, and employment in rural areas, family structures, education, technology transfer and internal migration, among other problems. A member of IDRC's Board of Governors, Gelia Castillo argues for the primacy of rural development in planning and thinking, a genuine "rural mindedness."

**Rural energy in Fiji: a survey of domestic rural energy use and potential.** *Suliana Siwatibau. Published in January 1981, 132 pages, IDRC-157e.*

This is the report of a project that surveyed current energy use and needs in selected rural areas of Fiji, and evaluated alternate sources of energy supply. An assessment is made of the merits of expanding the use of biogas, and the opportunities for improving domestic cooking conditions.

**IDRC program directions: Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; Social Sciences.** *Published in October 1980, 16 pages each.*

Basic information about each of IDRC's program divisions is presented in these four booklets. They outline the objectives, priorities, and operation of the divisions, including short descriptions of the areas of research supported. Short sections about project criteria and development are also included.

## Film

**Project IMPACT: the overview, produced by IDRC and the Regional Centre for Educational Innovation and Technology (INNOTECH), 16 mm, colour, 27.5 minutes.**

There are many problems facing developing countries in their efforts to provide a basic level of education for all their people, and especially for the majority who live in rural areas. Overcrowded classrooms, teacher shortages, inadequate facilities, high dropout rates, and soaring costs are just a few of them.

Project IMPACT in Indonesia and the Philippines is an experiment in mass primary education that is attempting to solve these problems through unconventional approaches... teachers who supervise individualized learning... students who work at their own pace using "instructional modules"... school buildings that have become community learning centres open to all.

How the system works is explained in *Project IMPACT: the overview*. This film is a remake of an earlier, longer film; its shorter length makes it suitable for television broadcasting. An English text and music-and-effects (M&E) sound track are available for translation and broadcast in other languages.

Also available is the companion film, *Project IMPACT: the system*. More

instructional in nature, this 37-minute film is meant to supplement *The overview* for those wanting more details.

Both films are available on loan or for purchase. Enquiries should be addressed to Public Affairs Unit, Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. In Asia, contact IDRC Regional Office for Asia, Tanglin P.O. Box 101, Singapore 9124, Rep. of Singapore.

*To order these publications or the film, as well as other IDRC productions, please consult ad on back cover.*





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# Reports

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FEBRUARY 1983

# THE IDRC Reports

*The IDRC Reports and companion editions Le CRDI Explore and El CIID Informa, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. Editor-in-chief Michelle Hibler. Associate editors: English edition: Rowan Shirkie; French edition: Jacques Dupont; Spanish edition: Stella de Felerbaum. Staff photographer: Neill McKee.*

## **Indexes to IDRC Reports Volumes 1-10 March 1971 to January 1982**

The annotated subject index lists articles according to their specific subjects or field of research. With few exceptions, they have been indexed using the *OECD Macrothesaurus for Information Processing in the Field of Economic and Social Development*. Authors' names appear as separate descriptors.

Articles are listed chronologically under each descriptor by volume (issue number): and page.

Most past issues of *Reports* are out of print, but they are available on microfiche at a cost of \$1 per issue.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street,

Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogotá D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 El Messaha St., Dokki-Giza, Cairo, Egypt).

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 2(4):2 (food shortages)  
 2(4):18 (in West Africa)  
 8(2):25 (climate changes and consequences)  
 DRUG ADDICTION  
 7(3):9 (drug abuse in West Africa)  
 9(1):13 (alcohol abuse)  
 DRUGS  
 9(3):8 (sales of dangerous pharmaceuticals)

## E

### EARTHQUAKES (see seisms)

### ECONOMIC DEVELOPMENT

2(2):2 (views of Louis Rasminsky)  
 3(1):4 (influence of Japan and China in Asia)  
 5(3):6 (grassroots level)  
 5(4):5 (artist and development)  
 7(3):16 (growth and conservation)  
 7(4):25 (World Development Report)  
 9(1):8 (New International Economic Order)  
 10(4):4 (tourism in developing countries)  
 10(4):7 (tourism industry in Africa)

### EDUCATION

3(3):12 (widening children's opportunities)  
 4(4):18 (rural development in Colombia)  
 5(3):7 (African universities)  
 6(2):3 (Project Impact in the Philippines)  
 6(3):21 (library needs in Africa)  
 7(2):16 (teaching by radio in Latin America)  
 7(3):24 (inappropriate in Third World)  
 8(1):14 (barriers to children's education)  
 8(1):16 (learning and malnutrition in Latin America)  
 8(1):17 (new system in Jamaica)  
 8(2):17 (learning by tape cassette in Latin America)  
 8(4):23 (farm radio in India)  
 9(1):10 (affecting populating growth)  
 9(2):14 (one-room schools in Egypt)  
 9(3):25 (need in Zimbabwe)

9(4):23 (videotapes for agricultural extension)  
 9(4):21 (using technological models)  
 10(3):16 (parents and children in Chile)  
 EDUCATIONAL INNOVATIONS  
 6(1):18 (satellite use)  
 6(2):3 (Project Impact in the Philippines)  
 7(2):16 (teaching by radio in Latin America)  
 7(3):26 (Project Impact in the Philippines)  
 7(4):25 (Impact system in Philippines and Indonesia)  
 8(1):17 (new primary education system in Jamaica)  
 8(2):17 (learning by tape cassette in Latin America)  
 8(3):23 (farm radio programs)  
 9(2):14 (one-room schools in Egypt)  
 9(2):24 (cassette forums in Uruguay)  
 EL HUSSEINI, AZZA  
 9(3):22 (elephant grass as animal feed in Egypt)  
 ELLIS, WILLIAM  
 8(4):24 (human needs in development)  
 EMPLOYMENT  
 3(2):29 (rural-urban migration)  
 4(3):12 (hawkers and vendors in Asia)  
 6(4):18 (hawkers in Southeast Asia)  
 8(1):14 (child labour)  
 9(1):10 (women's participation and fertility)  
 10(1):4 (microelectronics development and use)  
 10(2):4 (cotton crafts in Peru)  
 10(3):14 (in agriculture in Chile)  
 10(4):4 (in tourism industry)  
 ENDEMIC DISEASES (see also disease control)  
 4(1):8 (onchocerciasis in West Africa)  
 4(4):14 (fighting tropical diseases)  
 5(4):10 (dysentery in Bangladesh)  
 6(1):20 (tropical diseases)  
 7(1):6 (cassava toxicity)  
 8(1):3 (research in tropical diseases)  
 8(1):8 (animal trypanosomiasis in Africa)  
 8(2):12 (gastroenteritis in Latin America and the Caribbean)  
 8(4):20 (teaching sanitation in the home)  
 8(4):23 (smallpox eradication)  
 9(1):13 (rotavirus identification)  
 9(2):8 (cassava toxicity in Zaire)  
 9(4):4 (development-caused diseases)  
 10(1):13 (new drug against schistosomiasis)  
 10(2):12 (ineffectiveness of tuberculosis vaccine)  
 10(3):10 (Rift Valley fever)  
 10(3):22 (venereal diseases worldwide)  
 ENDRST, JEFF  
 8(3):12 (squatter settlements in Botswana)



## ENERGY

- 3(3):4 (crisis for poor countries)
- 3(3):8 (new sources)
- 4(3):22 (windmills)
- 4(4):7 (firewood shortage in Africa)
- 4(4):16 (solar energy in Mali)
- 5(3):18 (search for renewable sources)
- 5(4):8 (tropical forest exploitation)
- 6(1):23 (wind power in Ethiopia)
- 6(4):13 (consumption and conservation)
- 6(4):15 (solar cooker)
- 7(3):11 (energy and development)
- 7(3):12 (solar energy in the Indian desert)
- 7(3):13 (solar drying crops)
- 7(3):14 (solar water pump)
- 7(3):15 (windpower)
- 7(3):17 (biomass)
- 7(3):18 (biogas)
- 8(1):24 (IDRC study group)
- 8(2):3 (biomass)
- 8(2):6 (needs for development)
- 8(2):24 (renewable energy information in Asia)
- 9(1):13 (fuel from copa-iba)
- 9(3):8 (electricity from photosynthesis)
- 10(2):12 (energy bank funding)
- 10(2):17 (ethanol production and food needs)
- 10(2):13 (energy from palm oil wastes)
- 10(4):13 (use of jojoba oil in Brazil)

## F

### FAMILY PLANNING (see also contraception)

- 1(4):2 (population growth and health)
- 3(1):17 (role of midwives in Thailand)
- 3(4):4 (challenge to research and policy)
- 3(4):8 (UN population conference)
- 3(4):15 (Canadian views)
- 4(2):3 (Singapore's policies)
- 4(2):14 (contraceptive research in Egypt)
- 4(4):12 (clinics in Mali)
- 4(4):20 (population research in Southeast Asia)
- 5(1):18 (university research in India)
- 5(2):7 (village program in Thailand)
- 6(1):12 (projects and policies)
- 6(1):14 (research challenge)
- 6(1):16 (program in China)
- 6(1):17 (subfertility in Africa)
- 6(2):8 (role of midwives in Malaysia)
- 7(2):24 (education in Philippines)
- 8(1):12 (breastfeeding benefits)
- 8(1):18 (parenthood study)
- 8(2):9 (changing perspectives)
- 9(1):4 (and women's roles)

## FEFERBAUM, STELLA

- 4(3):16 (news from Latin America office)
- 5(4):18 (root crop importance)
- 7(1):8 (aids for health workers)
- 8(3):7 (home economics programs)

## FERTILITY

- 1(4):5 (fertility regulation research)
- 2(4):14 (decline in population growth)
- 3(4):26 (determinants)
- 5(1):18 (collaborative research in Asia)
- 6(1):14 (research global)
- 6(1):17 (subfertility in Africa)
- 6(2):18 (women's role in Asia)
- 8(1):12 (infertility during lactation)
- 8(1):18 (determinants in Asia)
- 9(1):10 (women's roles)

## FERTILIZERS

- 5(2):6 (human wastes in China)
- 5(3):18 (atmospheric nitrogen fixation)
- 5(3):18 (fertilizer efficiency in Asia)
- 7(1):15 (leucaena in the Philippines)
- 7(3):18 (biogas)
- 7(3):25 (mycorrhiza research)
- 8(4):16 (leucaena in the Philippines)
- 10(1):19 (nitrogen-fixation research in Canada)
- 10(4):18 (rock phosphates in Latin America)
- 10(4):20 (nitrogen-fixation in trees)

## FISH BREEDING

- 6(1):7 (carps in Malaysia)
- 6(2):13 (milkfish in Asia)
- 7(4):3 (new approaches)
- 8(1):24 (tilapia research)
- 9(1):12 (salmon gonadotropin for milkfish spawning)
- 10(4):14 (milkfish in Philippines)

## FISH CULTURE (see also aquaculture)

- 4(2):10 (projects in Asia)
- 6(1):7 (carps in Malaysia)
- 6(2):12 (harvesting in rural India)
- 6(2):13 (milkfish in Asia)
- 6(4):7 (waste treatment ponds)
- 7(4):3 (new approaches)
- 10(4):19 (Canadian research potential)
- 10(4):14 (milkfish in Philippines)

## FISHERY INDUSTRY

- 2(5):12 (improvements in West Africa)
- 5(4):3 (reducing waste)
- 9(1):12 (salmon gonadotropin, Canada)
- 9(4):21 (lantern fish as food)
- 10(1):12 (destructive means of capture)
- 10(3):10 (wastes as fish food in Brazil)

## FISHERY PRODUCTS PROCESSING

- 5(4):3 (reducing waste in Guyana)
- 9(3):30 (film on Guyana project)

## FLAKSTAD, NORDAHL

- 3(4):21 (improving health in Colombia)

## FLEURY, JEAN-MARC

- 6(2):6 (traditional and modern medicine in Africa)
- 6(3):18 (political changes in Nigeria)
- 6(4):9 (sorghum research)
- 7(1):19 (road building in Malaysia)



- 7(3):9 (drug abuse in West Africa)  
 7(4):6 (earthquakes in Ethiopia)  
 7(4):14 (science and industry)  
 8(1):6 (migration in Upper Volta)  
 8(1):20 (preparations for UNCSTD)  
 8(3):18 (small industries in Southeast Asia)  
 8(3):19 (information networks)  
 8(4):3 (housing the urban poor)  
 8(4):9 (UNCSTD success)  
 9(1):4 (plant breeders' rights)  
 9(1):7 (germplasm banks)  
 9(1):25 (INADES, Ivory Coast)  
 9(2):8 (cassava toxicity in Zaire)  
 9(3):4 (and Shirkie, R.: problems and prospects of biotechnology)  
 9(4):6 (construction of dam in Senegal)  
 9(4):14 (forestry in the Sahel)  
 9(4):19 (plantain research in Cameroon)  
 10(1):4 (and Shirkie, R.: microelectronics development and use)  
 10(2):6 (shea butter in West Africa)  
 10(3):9 (occupational health in Africa)  
 10(3):22 (venereal diseases)  
 10(4):20 (reforestation in the Sahel)
- FLORES, PEDRO V.  
 4(3):17 (population awards program)
- FOOD CROPS  
 4(1):4 (sorghum)  
 4(4):3 (potential of cassava)  
 5(1):7 (potatoes in Peru)  
 5(3):3 (cassava in Asia)  
 5(4):12 (triticale)  
 5(4):15 (underexploited plants)  
 6(1):23 (quinoa)  
 6(2):16 (sorghum in Senegal)  
 6(4):3 (legumes and cereals in Middle East)  
 6(4):15 (cowpea research)  
 7(1):3 (quinoa in Latin America)  
 7(1):22 (bananas and plantain research)  
 7(2):19 (better conservation and use)  
 7(4):12 (cowpeas in Upper Volta)  
 7(4):12 (protein needs)  
 8(1):12 (improving children's diets)  
 8(2):24 (potato puree)  
 8(3):24 (cowpea film)  
 8(4):10 (triticale in Kenya)  
 9(1):7 (germplasm collections)  
 9(2):4 (sorghum research)  
 9(4):7 (plantains in Cameroon)  
 9(4):26 (millet and sorghum book)  
 10(1):18 (Canadian research potential)  
 10(2):6 (shea butter in West Africa)  
 10(2):12 (winged bean)  
 10(2):20 (cowpeas in Thailand)  
 10(3):24 (pigeon peas in Kenya)  
 10(4):13 (potential of halophytes)
- FOOD POLICY  
 2(4):2 (food shortage)  
 3(2):4 (problems and population)  
 4(1):14 (population and food supply)  
 6(1):24 (priorities at the home level)
- 6(2):9 (technology to increase production)  
 6(2):11 (strategy for production)  
 6(3):25 (appointment of director of IFPRI)  
 6(4):16 (development not aid)  
 6(4):20 (projections)  
 7(1):25 (problems and prospects in Third World)  
 8(2):21 (planning for production)  
 9(4):8 (future planning)  
 9(4):11 (future strategies)
- FOOD PROCESSING  
 4(3):20 (postharvest rice technology in Asia)  
 4(4):16 (research in Asia)  
 8(1):12 (improving children's diets)  
 8(2):24 (potato puree)  
 9(1):20 (sorghum milling in Botswana)  
 9(2):26 (film on sorghum milling)  
 10(2):6 (shea butter in West Africa)  
 10(2):20 (cowpeas in Thailand)  
 10(3):11 (bananas in Latin America)
- FOOD STORAGE (and preservation)  
 4(3):20 (rice)  
 5(1):7 (potatoes in Latin America)  
 5(1):14 (reducing grain losses)  
 5(4):15 (simple technology in Kenya)  
 6(1):23 (joint program in Asia)  
 7(1):21 (film on maize losses in Kenya)  
 7(1):24 (irradiation research)  
 7(2):19 (reducing waste)  
 7(3):24 (maize in Kenya)  
 7(4):21 (solution to grain deficiency)  
 8(2):24 (storage bunkers)
- FORAGE CROPS  
 4(3):7 (desert research)  
 6(3):6 (by-products as cattle feed)  
 6(3):8 (pasture legume project in Caribbean)  
 6(4):3 (improved productivity in the Middle East)  
 7(1):15 (leucaena in the Philippines)  
 7(3):19 (research in Northern Mexico)  
 8(4):12 (raising livestock in Peru)  
 8(4):16 (leucaena in the Philippines)  
 9(3):22 (elephant grass in Egypt)  
 9(4):14 (trees in Sahel)  
 10(4):20 (trees in Sahel)
- FOREST ENGINEERING  
 4(4):17 (exploiting tropical forests)  
 6(1):9 (wood resources in Latin America)  
 10(2):24 (in the Amazon basin)
- FOREST PRODUCTS  
 4(4):7 (firewood shortage in Africa)  
 6(3):3 (uses in Africa)  
 8(3):3 (exploiting tropical moist forests)  
 8(3):20 (research and use of rattan)  
 9(1):13 (fuel from copa-iba tree)  
 9(4):14 (fuel and forage in the Sahel)  
 10(1):8 (tropical forests use and conservation)



- 10(1):13 (use of leucaena as food)
- 10(2):6 (shea butter in West Africa)
- 10(4):20 (acacias in Senegal)

#### FOREST RESOURCES

- 4(3):21 (survey of forestry research)
- 5(4):8 (exploitation of tropical forests)
- 6(1):9 (wood in Latin America)
- 6(3):3 (uses in Africa)
- 10(1):8 (tropical forests use and conservation)

#### FOREST UTILIZATION

- 4(4):7 (firewood in Africa)
- 5(4):8 (tropical forests)
- 6(1):9 (wood in Latin America)
- 6(3):3 (African trees)
- 6(4):15 (new Director-General ICRAF)
- 7(3):17 (energy)
- 7(4):21 (land management and agroforestry)
- 8(1):25 (forest land use)
- 8(2):3 (energy)
- 8(3):3 (over-exploitation)
- 8(4):16 (leucaena in the Philippines)
- 9(2):13 (agroforestry newsletter)
- 9(4):14 (in Sahel)
- 10(1):8 (tropical forests use and conservation)
- 10(1):10 (development of the Amazon basin)
- 10(2):24 (logging in the Amazon basin)

#### FORESTRY (see afforestation and reforestation)

#### FOX DE CARDONA, ELIZABETH

- 8(1):16 (nutrition and learning in Latin America)

#### FREEMAN, ORVILLE L.

- 9(4):11 (role of transnationals in development)

#### FRIESEN, J.K.

- 5(1):18 (contraception research in India)
- 5(2):7 (family planning in Thailand)

#### FUELS

- 4(3):5 (scientific progress in the Middle East)
- 4(4):7 (firewood shortage in Africa)
- 6(3):3 (uses of trees in Africa)
- 7(1):15 (leucaena in the Philippines)
- 7(3):17 (biomass)
- 7(3):18 (biogas)
- 8(2):3 (biomass)
- 8(2):7 (biogas from pig wastes in Singapore)
- 8(3):23 (ethanol production)
- 9(1):13 (from copa-iba tree)
- 9(3):4 (from biomass)
- 9(3):28 (biogas in Guatemala)
- 10(2):17 (versus food)
- 10(4):13 (jojoba oil in Brazil)

#### FUTURE

- 9(1):12 (predictions for the 1980s)
- 9(2):16 (Brandt report: a program for survival)

- 9(3):4 (biotechnology)
- 9(3):13 (IDRC's future focus)
- 9(4):7 (individual involvement in development)
- 9(4):8 (conference on the future)
- 10(3):10 (food supply problems)

## G

#### GASTROENTERITIS (see endemic diseases)

#### GENETICS

- 9(3):6 (genetic engineering)

#### GERZON, MARC

- 8(4):19 (Worldpaper)

#### GOLDEMBERG, JOSÉ

- 10(3):20 (repression of scientists in Latin America)

#### GORDON, J. KING

- 8(2):22 (UN Science and Technology Conference)

#### GRACHANGNETARA, SANTI

- 5(1):13 (Technonet)

#### GRAHAM, MICHAEL

- 7(1):22 (improving banana production)
- 8(3):20 (rattan use and research)
- 10(4):17 (workshops for project managers in Asia)

#### GRANT, LENNOX

- 10(4):10 (yellow fever in Trinidad)

#### GUTIERREZ, GERMAN

- 8(2):19 (improving Colombia's small farms)

## H

#### HANCHANLASH, JINGJAI

- 7(1):12 (diversity of Asia)

#### HANDICRAFT

- 8(4):22 (cooperative program in Bolivia)
- 10(2):4 (coloured cotton in Peru)
- 10(2):5 (artisan industry in Peru)

#### HANSON, H.

- 2(4):14 (food and population)

#### HEAD, IVAN L.

- 8(3):10 (Canadian science role in development)
- 9(3):13 (IDRC's future thrust)

#### HEALTH EDUCATION

- 3(4):21 (in Colombian homes)
- 4(2):3 (family planning in Singapore)
- 4(2):16 (doctors in Filipino villages)
- 4(3):16 (via health workers in Colombia)
- 5(2):6 (hygiene and sanitation in China)
- 5(2):10 (community health workers in Iran and Canada)
- 5(2):18 (via West African journal)
- 5(3):8 (rural health workers in Iran)
- 7(1):24 (basic hygiene in Togo)



- 7(3):3 (community health in Haiti)  
 7(3):9 (drug abuse in West Africa)  
 8(2):14 (teachers promote health in Latin America)  
 8(4):20 (sanitation in the home in Guatemala)  
 9(3):16 (rural health service in Colombia)
- HEALTH INDICATORS  
 7(1):8 (measuring nutrition and water purity)  
 7(1):24 (bangles to measure malnutrition)  
 10(3):11 (vaccine time-temperature indicator)
- HEALTH SERVICES (see also medical personnel)  
 3(2):32 (auxiliary health workers in Venezuela)  
 4(3):9 (Arab medicine)  
 4(3):16 (volunteer workers in Colombia)  
 5(3):8 (in rural areas in Iran)  
 5(4):15 (rural doctors in Thailand)  
 7(1):20 (development and survey in Nepal)  
 7(2):10 (nursing in Asia)  
 7(2):14 (medicine via satellite)  
 7(2):24 (mini-laboratory in China)  
 7(3):3 (in Haiti's villages)  
 7(3):21 (fighting disease in Vietnam)  
 7(3):24 (treatment of goitre in China)  
 7(4):15 (meeting village needs)  
 8(2):14 (through teachers in Colombia)  
 8(3):8 (health aides in Jamaica)  
 9(3):16 (rural health workers in Colombia)  
 9(3):25 (needs in Zimbabwe)  
 10(2):14 (nurse-practitioners in Thailand)  
 10(3):6 (occupational health in Thailand)  
 10(3):8 (occupational health in China)  
 10(4):12 (manuals for rural workers)
- HENRY, DAVID  
 5(4):16 (rural water supply)  
 6(3):15 (handpump improvements)  
 7(2):26 (water technology)  
 7(3):15 (wind energy)  
 8(2):6 (energy for development)
- HIBLER, MICHELLE  
 4(4):20 (population research in Southeast Asia)  
 4(4):22 (housing statistics in Asia)  
 5(1):3 (rural modernization)  
 5(1):14 (small-farm cropping systems)  
 5(2):13 (earthquakes in Ethiopia)  
 5(4):8 (use of tropical forests)  
 6(1):6 (operational health research)  
 6(3):9 (arms race)  
 6(4):13 (energy and development)  
 7(2):19 (reducing food waste)  
 7(3):18 (biogas for energy and fertilizer)  
 7(4):10 (controlling malaria)
- 7(4):15 (village health care)  
 8(1):12 (breastfeeding benefits)  
 8(1):12 (improving infant diets)  
 8(1):17 (improving education in Jamaica)  
 8(2):9 (changing perspectives in family planning)  
 8(2):12 (gastroenteritis in Latin America and the Caribbean)  
 8(3):8 (health aides in Jamaica)  
 8(4):20 (teaching sanitation in Guatemala)  
 9(1):10 (women's roles and fertility)  
 9(2):6 (biological control of cassava mites and mealy bugs)  
 9(4):18 (public enterprise in Thailand)  
 10(1):14 (water supply and sanitation decade)  
 10(1):18 (and Stanley, B.: Canadian research resources)  
 10(1):22 (labour migrations to industrialized countries)  
 10(2):14 (nurse-practitioner in Thailand)  
 10(2):20 (cowpea processing in Thailand)  
 10(3):6 (occupational health in Thailand)  
 10(3):12 (water buffaloes in Asia)  
 10(3):14 (and McKee, N.: rural squatters in Chile)  
 10(3):18 (science writers' workshop in West Africa)  
 10(4):14 (milkfish culture in Philippines)
- HILLEL, DANIEL  
 6(4):20 (future of humanity)
- HOME ECONOMICS  
 4(4):18 (towards rural development in Colombia)  
 8(3):6 (women's role in development)  
 8(3):7 (in Colombia)
- HOPPER, W. DAVID  
 1(1):18 (a view of development)  
 3(2):4 (food and population problems)  
 6(2):9 (food production technology)  
 7(1):25 (world food problem)
- HOUSING  
 3(1):11 (needs versus rice farming in Asia)  
 4(4):22 (low-cost in Asia)  
 5(2):12 (reconstruction in Guatemala)  
 5(3):12 (Habitat conference)  
 5(3):15 (IDRC's role at Habitat)  
 5(4):6 (squatters and needs in Latin America)  
 6(1):3 (squatters and low-cost housing)  
 6(2):18 (materials)  
 7(3):24 (straw as a building material)  
 8(3):12 (squatters self-help in Botswana)  
 8(3):17 (urban development in Colombia)  
 8(4):3 (urban poor)  
 10(1):12 (low-cost housing projects)  
 10(3):10 (new design from Canada)
- HULSE, JOSEPH H.  
 6(2):12 (fish harvest increases)



7(4):12 (solving protein deficiencies)  
HUMAN RESOURCES PROGRAM AND GRANT  
RECIPIENTS  
1(2):1 (IDRC program)  
1(2):2 (thesis research grant)  
1(2):10 (research fellows)  
2(5):22 (Canadian research grantee in Africa)  
4(1):12 (rainproofing soil - D. Hillel)  
4(2):7 (banana trade in Africa - P. Perrault)  
5(1):6 (potential of South American inland plain - G. Delgadillo)  
5(2):17 (law of the sea - E. Gold)  
5(4):5 (art and development - J. Wickham)  
6(2):15 (farmer's importance and food production - G. Castillo)  
6(3):24 (awards, population in Latin America)  
6(3):26 (computer modelling - D. Hillel)  
7(1):13 (learning through research)  
7(4):13 (rural water supply in Thailand - M. Thanh)

## I

### ICAMINA, PAUL

9(3):14 (village technology in Philippines)

### IDRC

1(1):3 (projects)  
1(2):1 (social sciences and human resources)  
1(3):3 (agriculture, food and nutrition sciences)  
1(3):25 (LARO)  
1(4):3 (population and health sciences)  
1(5):2 (Chairman Lester B. Pearson)  
2(1):2 (information sciences)  
2(2):2 (Chairman Louis Rasminsky)  
2(3):3 (organization and officers)  
2(2):5 (social sciences networks)  
2(5):3 (focus on Africa)  
3(1):7 (research in Asia)  
3(3):24 (Ford Foundation views)  
4(1):10 (Asia regional office report)  
4(1):10 (establishment of MERO)  
4(1):11 (creation of Program Support Unit, LARO)  
4(2):8 (in West Africa)  
4(2):9 (in Middle East)  
4(2):9 (in Latin America)  
4(2):15 (President David Hopper)  
4(2):15 (Governors' meeting)  
4(3):16 (news from LARO)  
4(3):16 (news from Middle East)  
4(3):17 (appointment of S. Adotevi at WARO)  
4(3):21 (president's new advisor, J. Bene)  
4(4):15 (opening of EARO)

5(1):12 (Latin America agricultural research needs)  
5(2):8 (food science program in Asia)  
5(2):9 (Board of Governors meeting, Bogota)  
6(2):18 (J. Hulse award)  
6(3):24 (R. Blais award)  
6(3):25 (J. King Gordon, Order of Canada)  
6(3):25 (book fair Singapore)  
6(4):10 (senior management changes)  
7(1):11 (approach to development)  
7(1):22 (President Ivan Head)  
7(1):24 (L. Berlinguet appointed to ACAST)  
7(2):6 (Board of Governors' meeting)  
7(3):24 (J. Hulse, IUFOST president)  
7(3):24 (E. Corea appointment)  
7(4):25 (D. Steedman and R. MacIntyre appointments)  
8(1):24 (renewable energy study group)  
8(2):11 (research in Latin American and the Caribbean)  
8(3):10 (focus on Canadian scientists)  
8(4):23 (WARO regional director)  
9(1):16 (social science research in Africa)  
9(3):9 (first 10 years)  
9(3):10 (interview with Rex Nettleford on first 10 years)  
9(3):13 (future focus of IDRC)  
9(3):18 (regional activities)  
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9(4):20 (appointment of LARO director)  
10(1):16 (cooperative programs launched)  
10(4):9 (cooperative programs)  
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10(1):25 (development in Latin America)  
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3(1):20 (Technonet in Asia)  
3(4):27 (Technonet's first meeting)  
6(1):23 (Technonet Phase II)  
7(1):16 (improving production in Asia)  
8(3):18 (small industries in Southeast Asia)  
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6(4):11 (applying science and technology)  
7(4):14 (science and industry)  
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10(3):6 (health hazards in Thailand)  
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6(2):17 (information revolution)  
7(4):17 (needs for development)  
8(2):24 (renewable energy in Asia)  
9(1):25 (African Institute for Economic and Social Development, Ivory Coast)



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- 3(3):19 (creation of DEVSIS, INIS and AGRIS)
- 4(2):14 (AGRIIS - agriculture)
- 4(3):20 (planned water-supply system)
- 4(4):6 (cassava documentation centre)
- 7(1):24 (cassava information centre)
- 7(2):17 (AGRINTER links scientist and farmer)
- 7(4):17 (needs for development)
- 8(1):24 (UNEP reference system)
- 8(3):19 (improving international access)
- 8(4):6 (in China)
- 10(2):13 (archives in Cameroon)
- 10(3):11 (date information centre)
- 10(3):12 (buffalo information centre)

## INGRAM, J.

- 4(2):9 (diversity of Middle East)

## INTERCROPPING (see cultivation systems)

## INTERNATIONAL MIGRATIONS

- 8(1):6 (in West Africa)
- 9(3):8 (reverse 'brain drain' program)
- 9(3):25 (return of exiles to Zimbabwe)
- 10(1):22 (labour migrations)

## IRRIGATION

- 4(3):10 (problems in Egypt)
- 7(2):24 (inflatable dam)
- 7(3):19 (water shortage in northern Mexico)
- 9(4):4 (health problems)
- 9(4):6 (construction of dam in Senegal)
- 9(4):21 (Mayan canals discovered)
- 10(4):13 (use of halophytes to solve salt deposits)

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## JAYEWARDENE, B.H.S.

- 7(3):8 (agricultural reporting in Sri Lanka)

## K

## KAPPAGODA, NIHAL

- 4(1):10 (Singapore office)
- 4(2):8 (seminar report)
- 4(2):15 (Governors' meeting)
- 5(1):12 (UNCTAD preparations)
- 5(3):16 (grassroots development needed)

## KING, KENNETH

- 8(1):25 (causes of underdevelopment)

## KOBLINSKY, MARJORIE

- 7(1):18 (research on pill safety in Asia)

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## LAILAW, JOHN

- 4(3):16 (news from Middle East office)

## LAING, MACK

- 6(2):21 (public understanding of science)

## LAMBRECHT, FRANK L.

- 9(4):4 (health hazards of development)

## LAND SETTLEMENT

- 7(3):6 (nomad resettlement in Somalia)

## LAND TENURE

- 4(4):11 (solving problems in Senegal)
- 9(3):25 (changes in Zimbabwe)

## LAND USE

- 4(4):7 (firewood shortage in Africa)
- 7(4):21 (land management and agroforestry)
- 8(1):25 (causes of underdevelopment)
- 9(4):24 (traditional patterns in Haiti)

## LAPOUS, ANNICK

- 6(1):17 (subfertility in Africa)

## LAQUIAN, A.A.

- 3(1):7 (IDRC research in Asia)
- 5(3):12 (Habitat conference)
- 6(1):3 (squatters and slums)
- 7(3):6 (nomad resettlement in Somalia)
- 9(1):16 (social science research in East Africa)

## LEATHERDALE, DON

- 4(2):14 (AGRIIS - agricultural information system)

## LEBLOND, R.

- 5(3):5 (remote sensing and mapping)

## LEGER, J.M.

- 5(3):7 (challenge for African universities)

## LEGUMINOSAE

- 6(4):3 (broad beans, lentils and chickpeas in Middle East)
- 6(4):15 (cowpea research)
- 7(2):19 (preservation and processing in Africa)
- 7(4):12 (cowpeas in Upper Volta)
- 8(1):12 (in infant foods)
- 8(3):24 (film on cowpeas)
- 10(2):12 (winged bean institute)
- 10(2):20 (cowpea processing in Thailand)
- 10(3):24 (pigeon peas in Kenya)

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- 6(2):19 DURST M.E. (culture and development)
- 6(2):19 NJERU S.J. (armament and development)
- 6(2):19 OETTINGER W.H. (sorghum thresher)
- 6(3):24 WEBBER H.H. (fisheries research centres)
- 6(3):24 STAPLETON G.B. (Nigerian midwives)
- 6(3):24 RATNAYAKE N. (traditional medicine)
- 7(2):25 AGINA O. (libraries in Kenya)
- 7(2):25 SINGH A.K. (approach to development)
- 7(2):25 NESTEL B.L. (cassava toxicity)
- 7(3):25 NANAYAKKARA D.D.E. (cropping systems)



- 7(3):25 OPARA A.K. (appropriate technology)
- 7(4):26 JEANES C.W.L. (health in Vietnam)
- 7(4):26 LANGLEY P. (traditional medicine)
- 8(1):23 AGARWAL A.K. (BCG vaccine in Vietnam)
- 9(1):2 BREM M. (international development trends)
- 9(1):2 McPHAIL T. (Canadian coverage of development)
- 9(2):2 COATES G.L. (low-cost housing)
- 9(2):2 ST-PIERRE C.A. (breeder's rights)
- 9(2):2 BRADNOCK W.T. (breeder's rights)
- 9(3):2 BUCHANAN R. (Reports)
- 9(3):2 de SOLLA PRICE D. (women's roles and fertility)
- 9(3):2 CRENER M.A. and MEHMET O. (new development journal)
- 9(3):2 KULESHA L.M. (food research and development)
- 9(4):2 ZACHARIAH M. (aid and education)
- 9(4):2 LAL A.K. (cassava and salt)
- 9(4):2 CHANG H.C. (breeder's rights)
- 9(4):2 MOONEY P.R. (breeder's rights)
- 10(1):2 MYRES A.W. (breastfeeding)
- 10(1):2 CHERUVIL J. (cassava in India)
- 10(1):2 OSTHANADA P. (aid policies in Thailand)
- 10(2):2 LAKHAN S. (Paulo Freire)
- 10(2):2 LAMBRECHT F.L. (blackflies error)
- 10(2):2 CHAO-CHANG R.H. (IDRC's approach)
- 10(2):2 MEHROTRA N. (sorghum and millets)
- 10(3):2 MYERS R.G. (work migrations)
- 10(3):2 WILSON S.E. (bananas in Jamaica)
- 10(4):2 AUSTENSON H.M. (Canadian grain exports)
- 10(4):2 CHERUVIL J. (forests in India)
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- 6(3):21 (shortage in West Africa)
- 8(4):6 (in China)
- 10(2):13 (archives in Cameroon)
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- 4(3):14 (cattle feeds in Latin America)
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- 5(3):3 (cassava as feed in Asia)
- 5(3):10 (diseases in Africa)
- 6(3):6 (feed and forage in Egypt)
- 6(3):8 (forage in the Caribbean)
- 6(4):3 (medicago for sheep in Middle East)
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- 7(3):19 (forage for milk production in Mexico)
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- 8(2):7 (algae from water treatment as pig feed)
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- 8(4):16 (leucaena as feed in Philippines)
- 9(2):4 (cassava as feed)
- 9(2):13 (buffalo research in Asia)
- 9(3):7 (cassava feeds)
- 9(4):20 (goat research)
- 10(1):11 (in Amazon basin)
- 10(2):12 (wild animals)
- 10(2):24 (in Amazon basin)
- 10(3):12 (water buffaloes in Asia)
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- 7(2):10 (nursing needs in Asia)
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- 7(1):21 (improving storage in Kenya)
- 7(2):19 (reducing waste)
- 7(3):24 (biological control of moths)
- 10(1):12 (discovery of primitive variety)
- 10(2):17 (for alcohol production)
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- 4(4):14 (global research)
- 5(3):18 (culture of)
- 7(4):10 (resurgence)
- 8(1):3 (research hopeful)
- 8(4):23 (malaria vaccine)
- 9(1):19 (research progress)
- 9(3):4 (development of vaccine using biotechnology)
- 9(4):4 (risks of development projects)
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- 5(3):16 (challenge for development)
- 7(1):8 (tri-coloured strip)
- 7(1):24 (use of bangles to identify children)
- 8(1):16 (children in Colombia)
- 8(2):12 (and gastroenteritis in Guatemala)
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- 9(2):11 (training workshop for finance officers in Asia)
- 10(4):17 (training workshops for project managers in Asia)
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- 5(2):13 (earthquake zones in Ethiopia)
- 5(3):5 (satellite surveys)
- 7(2):15 (satellite photographs)
- 9(3):20 (land use and planning maps in Togo)
- 9(4):21 (discovery of Mayan canals)
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- 3(4):24 (Asian hawkers)



4(3):12 (street trading in Asia)  
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 6(3):11 (meeting water supply needs)  
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 9(3):28 (biogas production in Guatemala)  
 10(3):14 (and Hibler, M.: rural squatters in Chile)  
 10(3):16 (parents and children education in Chile)  
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 7(3):3 (community health in Haiti)  
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 5(2):9 (workshop for science editors in Colombia)  
 5(2):18 (periodical in West Africa)  
 5(3):16 (and grassroots development)  
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 6(1):23 (seminar in Middle East)  
 6(2):21 (understanding science)  
 6(2):22 (government and media)  
 7(2):11 (means of communicating)  
 7(2):12 (newspaper as catalyst)  
 7(2):13 (journalists and development)  
 7(2):14 (communications technology)  
 7(2):16 (radio school in Latin America)  
 7(2):18 (two development magazines)  
 7(2):24 (Sylva Africana)  
 7(3):8 (agricultural reporting in Sri Lanka)  
 7(4):20 (understanding science)  
 8(1):19 (science news feature service in Asia)  
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 10(3):18 (science writers' workshop in West Africa)  
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 3(1):17 (midwives and family planning in Thailand)  
 3(2):32 (auxiliaries in Venezuela)  
 3(3):17 (in Iranian villages)  
 3(4):21 (in Colombian homes)  
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 5(2):10 (community workers in Iran and Canada)  
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 6(1):6 (doctors versus auxiliaries)  
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 7(1):8 (auxiliaries in Colombia)  
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 5(1):16 (improving postharvest methods)  
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- MULLIN, JIM  
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- MUNENE, FIBI  
10(3):24 (pigeon peas in Kenya)  
10(4):8 (low-cost transportation in Kenya)
- MYERS, NORMAN  
8(3):3 (exploitation of tropical forests)  
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10(4):12 (guidelines for pesticide use)
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- OYSTER CULTURE  
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- PENG, J.Y.  
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- PEST CONTROL  
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8(2):24 (pyrethrum research)  
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9(2):6 (biological control of cassava mites and mealy bugs)  
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9(1):4 (plant breeders' rights)  
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- 4(4):20 (population research in Asia)  
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- POVEY, GEORGE  
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- RAO, M.S.  
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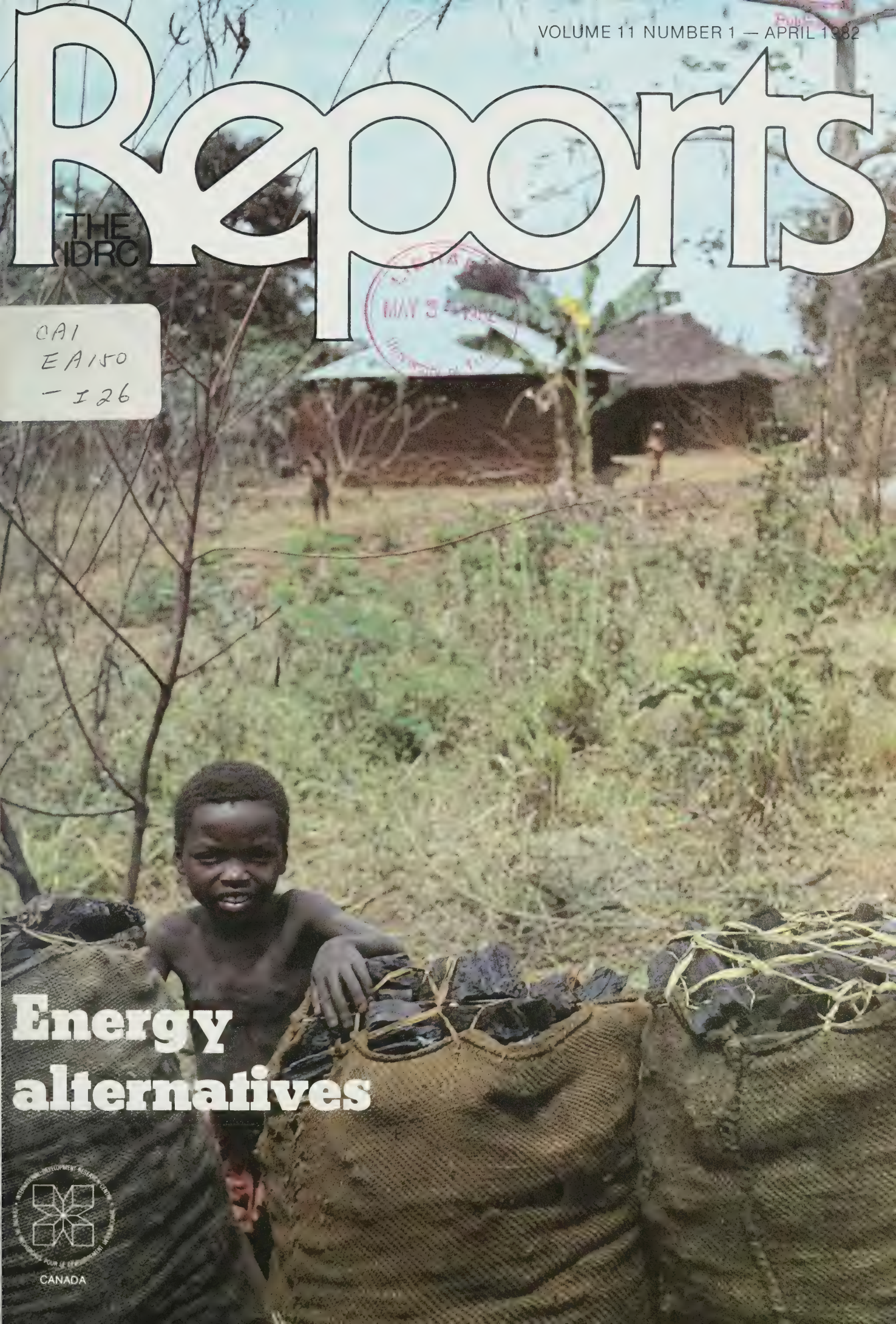


In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# Reports

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## Energy alternatives





# LETTERS

## Regrets

"Food and population: the unequal equation" (*Reports* 10(4), January 1982), which was co-authored by Norman Borlaug, Ernest W. Sprague and R. Glenn Anderson, was written in 1980 when Dr Anderson was Director of the Wheat Program at the International Maize and Wheat Improvement Centre (CIMMYT). It is a matter of very great sadness to his many friends in IDRC that Dr Anderson passed away during 1981. We sincerely regret that this was not noted when the article was published. We have recently learned that the present Director of the CIMMYT Wheat Program is Dr Byrd Curtis.

## Playing with propaganda?

It was indeed surprising to find the article "Playing it safe" in *Reports* 10(3), October 1981). Since this article is based on the statements of Dr Li Shiyou of the Health Research Institute of the Chinese Academy of Medical Sciences, who is responsible for health policies, it can hardly be objective.

In addition, it contains no references from other sources, nor does it report on the personal experience of the author in China.

The article is decidedly one-sided and one must conclude that occupational diseases of farmers and workers in China have been eradicated.

Even propaganda should appear to be more plausible and less loaded with generalizations. Facts such as how much money, what diseases, and how

they have been treated are little in evidence. Such glaring inattention to detail has no business in a scholarly publication.

Stanislaw Urbanik  
Ottawa, Canada

*Editor's note: The article was prepared for Reports by China Features, a reputable Beijing-based agency specializing in information on the People's Republic of China. A number of claims made in the article are corroborated in past issues of the Chinese Medical Journal, published by the Chinese Medical Association.*

*The article was not intended to present a complete picture of occupational health problems and solutions in the PRC, but simply to indicate that one developing country has integrated these concerns in its health policies and to give some indication of the approaches taken.*

## Alcohol from cassava

I would like to comment on your article "Fuelling controversy" (*Reports* 10(2), July 1981).

Cassava can be used for fuel alcohol production and it is a good crop for small farmers because it can be intercropped with food crops such as beans, corn, sweet potato, rice, etc. At Brazil's National Research Centre for Cassava and Fruit Crops, scientists are working to develop a new spacing system to allow intercropping. Called *fileiras duplas* (double rows), the system consists of planting two rows of cassava 60 cm apart; these double rows are then separated by a 2-metre space in which other

crops are planted.

Planting cassava rather than sugar cane for alcohol production has three advantages: first is the alcohol itself; second, the double row system allows farmers to grow other crops for human consumption; and third, the mixture of crops may help keep the ecological equilibrium.

Rui Américo Mendes  
Agronomist  
Cruz das Almas, Brazil

## Shea butter

I read your article on shea butter trees with interest (*Reports* 10(2), July 1981). At the same time I was surprised that you excluded Ghana from the list of countries which produce this "natural" butter.

In Hausa language it is called *mai*, in Frafra language it is called *sukpam*, and in the Ashanti and Southern Ghana it is popularly known as either *nku* or *ngu*. In the Volta region it is called *yokumi*.

The shea butter tree grows widely like the baobab tree in Northern and Upper Ghana and in the Afram plains, which have the same savanna type of vegetation. Effective November 1981, the producer price of shea nuts is 400 *cedis* (Cdn\$175) (old price 110 *cedis*) per 62 kg. It is officially considered as a cash crop and it is rated third after cocoa and coffee.

S. Kofi Odoteye  
United Nations-IDEP  
Dakar, Senegal

## Rural health manuals

In the "Briefs" columns of the latest *Reports* (10(4) January 1982), a short descriptive piece entitled "Rural health manuals"

instructs readers to contact the African Medical and Research Foundation (AMREF) at its headquarters in Nairobi in order to obtain its publications.

The Overseas Book Centre (OBC) in Ottawa has taken over the distribution of all AMREF material to interested nongovernmental organizations in Canada for use in the Third World. The OBC will also send lists of available AMREF material to its recipients in the medical field overseas.

For further information, your readers should contact our national office at 321 Chapel Street, Ottawa, Canada K1N 7Z2.

Richard C. Day  
Overseas Book Centre  
Ottawa, Canada

*Letters from readers are welcomed, and should be addressed to:*

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# Reports

THE IDRC

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**Cover:** A young charcoal vendor awaits customers in Tanzania. In many developing countries, the fuelwood crisis has reached alarming proportions. Research on noncommercial sources of energy could improve the lives of rural people most affected by the shortage.

**Back cover:** One solution is to grow more trees: An Egyptian girl transplants casuarina seedlings. See article page 4.

# POWERING DEVELOPMENT

## ENERGY FOR THE RURAL POOR

MICHELLE HIBLER

**A**lmost a decade has elapsed since the energy crisis first captured the world's headlines. But in the developing countries, the crisis began long before the fourfold increase in the price of oil in 1973-74 and has been felt with much more immediacy than in the industrialized world.

Today, in fact, developing countries still only account for less than one-fifth of world commercial energy demand, mainly for their industrial and transport sectors. Up to 40 percent of their energy needs are met by fuelwood and other noncommercial sources — agricultural wastes, animal dung, etc. For these countries, the energy crisis means the growing scarcity of traditional fuels rather than the scarcity of oil. For their populations, the major energy problem is simply finding enough wood each day with which to cook.

The World Bank's *World development report 1981* states that "the two critically scarce fuels in the 1980s are oil and fuelwood." According to a recent FAO survey, more than 100 million people cannot obtain sufficient fuelwood to meet their minimum needs right now. And supporting World Bank statistics reveal close to 70 developing countries have a fuelwood shortage, or will have by the end of the century.

The problem is by no means new in many parts of Africa, Asia, and Latin America, where population growth and the need to clear land for agricultural use have long put pressure on forests. But the scarcity is now exacerbated as the higher prices of conventional energy raise the demand for traditional fuels, especially charcoal, in urban areas.

In many densely populated countries, forests have shrunk dangerously. The use of wood is greater than sustainable forest yield in several countries; and in many more, deforestation is a serious problem because fuelwood cannot be transported economically over long distances.

As forests disappear, people in rural areas must spend more time collecting fuel, often at the cost of working the land for food production. The poorest are the worst affected since they can least afford to buy fuel. In parts of Africa, people have been reduced to eating only one cooked meal a day.

As wood becomes scarce, people burn more dung and crop wastes that could be better used as fertilizer. The

United Nations estimates that this lost fertilizer could provide an additional 20 million tonnes of grain a year. A vicious cycle of depletion, soil loss, lowered crop production, lower incomes, and, hence, greater dependence on "free" fuels like firewood is created.

Environmental problems also ensue. When trees and other vegetation are removed, the soil is eroded and riverbeds and canals silt up. Deforestation also reduces the earth's capacity to absorb the extra carbon dioxide caused by burning fossil fuels.

One-quarter of the world's land surface is now forested, but this is expected to drop to one-fifth by the end of the century. Although deforestation is not a new problem, the rate of destruction is unprecedented (see *Reports* 10 (1), April 1981) and has reached alarming proportions in the Third World. For developing countries as a whole, forests are likely to shrink by 40 percent in the next 20 years.

In recognition of this fact and seeing no viable substitutes for fuelwood in many regions of the world, the United Nations Conference on New and Renewable Sources of Energy (UNCNRSE), held in Nairobi in August 1981, adopted a resolution calling for the immediate acceleration of reforestation and afforestation programs. The goal would be to achieve a fivefold increase in annual tree planting rates by the year 2000.

Other recommendations at the conference included improved distribution of fuelwood plantations, improved conversion technologies, and the use of more and better wood-burning stoves.

Firewood was only one source of energy considered at UNCNRSE. In the energy mix that could be applied to developing countries, solar and wind power have a great deal of potential. Using presently available technologies — some of which have changed little for centuries — they are already economic alternatives in some applications such as crop drying, small-scale electricity generation, and water pumping.

Of the various energy-harnessing technologies considered, only hydroelectric power was considered to be "fully mature" and is expected to be the major energy growth area in the near future. Some 16 percent of the world's potential hydroelectric power is currently used, providing 23 percent of the world's electricity. Developing countries have about half the world's potential, but so far only nine percent

has been exploited, supplying electricity to only 12 percent of their population. Small-scale hydro projects could allow these countries to exploit their abundant waterpower resources for the benefit of rural populations.

The Programme of Action adopted at the conference calls for efforts in five broad policy areas: energy assessment and planning; information flows; research, development, and demonstration; transfer, adaptation, and application of mature technologies; and education and training.

These priorities are echoed in IDRC's energy research program. Of the Cdn \$40 million of allocations to energy activities announced at UNCNRSE by the Prime Minister of Canada, Pierre E. Trudeau, \$10 million will be channeled through IDRC over the next four years, beginning in April 1982, in support of energy research related to developing countries.

IDRC is not a newcomer to the field of energy research. Some 50 projects involving energy research have been supported in the past 11 years throughout the developing world, at a cost of some Cdn \$7 million. They include rural energy surveys, studies of national energy policies, technology assessments, experimental fuelwood plantations and biogas generation plants, and the design of small postharvest technologies. A few of the projects are described on these pages.

Under the expanded program these activities will continue and new initiatives will be undertaken. There will be increased support for research in forestry and on fuel-related aspects of postharvest technologies. A new sub-program will be created to support research in developing countries on energy policies, and the information requirements of developing areas will be examined. The Centre's Cooperative Programs Unit (see *Reports* 10(4), January 1982) will review the prospects for collaboration between Canadian and Third World scientists, including cooperation on the development of technologies.

The most significant of the proposed new initiatives will be the creation of a research advisory group, the Energy Research Group (ERG). Composed of

*Engineers in Egypt test an experimental solar dryer. The sun is one of many non-commercial sources of energy that could be exploited in rural areas of the Third World.*







eminent researchers and policymakers from developing countries, the ERG will review energy research needs, priorities, resources, and technologies in the energy sector to assist developing countries to develop their own strategies. IDRC also intends to strengthen communications between donor agencies active in energy research.

The transition away from the dominant use of oil into a new sort of energy mix will not be easy, nor will it be cheap. Most experts agree, however, that it can be done.

But just as new and renewable sources of energy cannot be viewed in isolation from an overall energy approach, energy problems and projects

cannot be separated from the environment in which they occur. And as Enrique Iglesias, Secretary-General of the UNCNRSE, points out: "It would be a tremendously misleading policy to divert attention from the real and most essential element — development. ... Alternative sources of energy are only tools for achieving that end." □

## A COOL STRATEGY

Known as the Golden Triangle, the mountainous northern region of Thailand, the Shan Plateau in Burma, and an adjoining area of Laos are the source of most of the world's illicit opium. Chasing the dragon there (as efforts to eliminate the drug trade are called) through law enforcement and destruction programs has proven so difficult as to be virtually ineffective. Less than five percent of the opium is intercepted.

For the impoverished hill tribes that grow opium poppies, the crop provides income, security, and medicine — needs that could be met in other ways. That is the thrust of a displacement strategy formulated by the United Nations Fund for Drug Abuse Control (UNFDAC) and the Thai government's Royal Northern Project. They hope to encourage the production of various fruits, vegetables, and flowers as cash and food crops on land where poppies now grow.

Political pressure — particularly

from industrialized countries with drug abuse problems — to stop the trade at its source is growing. Poppy production has also resulted in severe environmental problems in Thailand. It is estimated that 20-40 000 hectares of land have been eroded as a result of deforestation and soil depletion by poppy growers who strip the land and then move on.

Cool storage for the replacement crops may be critical to the success of UNFDAC's strategy. Extending the stored life of the fruits, vegetables, and flowers will allow more flexibility in marketing, holding stocks until prices are good. Cool storage would also maintain the products' quality, thus commanding better prices, and would allow the consolidation of loads for better fuel economy when trucking to markets.

With support from IDRC, the Faculty of Engineering of Chiang Mai University has set about to develop a low-cost, rugged, simple-to-use passive solar cooler for the program. Set into the hillsides to take advantage of the earth's insulating properties, the cooling cham-

bers will be essentially large (5 x 7 x 3 metre) radiators. A water reservoir fitted with conducting fins that extend into the chamber's interior will act as a heat sink, drawing heat from the room and radiating it into the cooler air at night. During the day, an insulating cover will prevent heat gains. Dr Piyawat Boon-Long, the principal researcher, calculates that it will thus be possible to maintain the temperature inside the chamber at 5-10 °C below outside air temperatures. The resulting storage temperatures of about 15 °C in summer and 10 °C in winter will be cool enough to meet storage requirements of many of the new crops being introduced.

Proper storage techniques and the keeping qualities of various commodities will be determined. The researchers then hope to study the social and economic conditions that would influence the successful adoption of a passive cooler.

Rowan Shirkie

## SAHEL FOREST ENERGY

With the disappearance of natural forests in many parts of the Sahel, the firewood shortage has become acute, particularly in highly populated areas. To help solve this problem, the government of Niger requested IDRC assistance in 1973 in carrying out a project aimed at producing firewood and utility lumber by establishing village woodlots.

In three regions in the south of the country — Myrria, Magaria, and Matamèye — nurseries were established to produce seedlings. Various seed-growing techniques were tested and improvements made. At Matamèye, the researchers from the Water and Forestry Services of the Ministry of Rural Development developed an innovative sand and plastic sheeting capillary watering technique for germinating beds that proved highly successful.

Simple techniques were also developed for brush clearing, stump removal, and surface soil preparation.

Planting trials showed that a good survival rate and rapid growth of seedlings could be achieved if a hole 60 centimetres square by 35 cm deep was dug around the plants. Good success was also obtained in some plots using the fishbone technique: Earth is mounded on the downhill side of the hole to create a basin. Trenches link this basin to two others, thus creating a terracing effect. Erosion is prevented and maximum use is made of rainfall.

Experiments with the *taungya* method — growing food crops between the trees — also proved successful and taught the peasants that trees and food crops could be grown together.

The best results were achieved in the Matamèye region where 31 villages participated in foresting 80 hectares. More than 90 percent of the trees survived. Around Magaria, 21 villages planted 55 hectares with a survival rate of 60 percent. Unfortunately, the results were not as good in Myrria where conditions are much more difficult.

A total of 165 hectares were planted in 59 villages. Of the 20 exotic tree species introduced, the Neem (*Azadirachta indica*) and *Eucalyptus camaldulensis* had the best survival rates.

The first plantations established in 1974-75 are now awaiting exploitation, due to begin in May 1982. The peasants will decide on how they are to be cut, and will reap the harvest.

Technicians have now launched a second phase of the project in nine villages around Matamèye. The testing of indigenous and exotic tree species will continue and simple methods will be developed for producing plants and planting trees in stands and scattered in farmers' fields. Villagers will then be taught the most appropriate techniques to ensure that they can continue the work by themselves.

Abdoulaye Boureima



## TAPPING BIOGAS

Methane generated by fermenting animal, human, and agricultural wastes has been a source of household cooking and lighting energy in rural areas for many years, particularly in Asia.

As the price of petroleum fuels continues to rise and alternative sources like fuelwood dwindle, governments have become increasingly interested in exploiting biogas systematically on a much larger scale. But like any other technology, successful implementation of biogas production facilities requires a thorough understanding of the social and economic environment into which it is to be introduced.

IDRC has supported four countries—Korea, Thailand, Bangladesh, and the Philippines—in carrying out social and economic evaluations of biogas technology. The recently completed studies should provide the government of these countries with useful planning information, not only on biogas, but also on the problems that the introduction of new technologies can create.

● In Korea, the research team from the Office of Rural Development found that biogas plants were mainly exploited by wealthier peasants who

could afford the capital cost of equipment and installation. The energy savings they realized enabled them to recover the costs within four to five years. Climatic conditions were an important operating factor: an average of only 113 days a year in Korea are warm enough for biogas production. Researchers also found that a number of digesters were cracked or had been badly installed. As a result, the team recommended that the government install community-scale units capable of functioning year-round.

● In Thailand, a genuine enthusiasm for biogas plants was reported. This was not only because of the savings and energy independence they afforded, but because the plants helped control the spread of disease from animal wastes that had hitherto been a disposal problem. But tractors are gradually replacing draught animals in the country, and the feedstock for biogas generation is becoming scarcer. The surge in the popularity of tractors is due only in part to their versatility, the study notes. They can also be dismantled at night and brought inside the household, safe from thieves who often make off with unguarded animals. And although the benefits of biogas technology are recognized in the Thai study,

some concerns were raised about cost effectiveness and durability.

● In Bangladesh, where only seven percent of the population is self-sufficient in food, farmers were found to be much more interested in increasing crop yields through fertilization than in energy. Most farmers are too poor to afford biogas generators. The researchers considered biogas technology more appropriate to providing street lighting in villages than energy in homes.

● Most biogas plants in the Philippines are in the province of Luzon. Users there, it appears, are mainly more prosperous farmers over 40 years old. The appeal to these users lay again in energy savings and the fertilizer value of the slurry. Seventy percent of all biogas plants that had been installed were still functional. The study found that cracking or improper installation were the prime reason the other plants had been abandoned. The recommendation of the Philippine study was that the government provide better training for users, and promote the technology vigorously.

*Jacques Dupont*

## WIND OF CHANGE

Windmills. The Persians used them to grind grain in the 7th century AD. At the peak of their popularity, at the end of the 19th century, some six million were pumping water in the U.S.A. alone. And today, after decades of neglect, they are enjoying a renaissance, particularly for small-scale water pumping applications.

This technology could be of great value in the rural areas of the Third World where the cost of operating diesel-powered pumping stations has become prohibitive. But if wind-harnessing machines have come a long way in the last ten years, most new windmills—at a cost of US\$4000-\$8000 each—are too expensive and too complex for widespread use in developing countries. For windpower to reach its full potential, simple, robust, and inexpensive machines need to be designed.

Once such machine came to light in Ethiopia in the mid-1970s—the Filippini wind rotor. Designed by Armando Filippini, an Italian working in Ethiopia, the three-blade, vertical axis rotor was built using local materials and skills.

Preliminary trials in Ethiopia showed that, at winds averaging 18 kilometres per hour (kph), a rotor two metres high and two metres in diameter, coupled to a standard pump, could pump 400 litres of water an hour from a well 23 metres deep—enough water for 50 head of cattle. With IDRC support, the University of Waterloo (Canada) then carried out a series of tests to document the Filippini rotor's characteristics. The rotor was found to be simple to build, and harnessed 25 percent of the wind's force when blowing at 25 to 40 kph.

Using this data, research teams in Ethiopia and Botswana launched field tests of the rotor coupled with different types of water pumps. In Botswana, the Rural Industries Innovation Centre (RIIC) and Pelegano Village Industries (PVI) built four rotors of different sizes and of different materials. Tests carried out over two years showed that a locally produced Filippini windrotor could pump sufficient water for a small community at a reasonable cost.

However, wind speeds in Botswana had been underestimated at the start of the project—and during the Waterloo

tests—and the researchers found that the larger rotors could not withstand the strong seasonal winds that gusted to 70 kph. Modifications needed to make the rotor and tower strong enough increased its cost significantly.

If the Filippini wind rotor proved not to be suitable to Botswana's conditions, at least the testing will have contributed to the growing body of knowledge on wind-pumping devices. And, during the course of the project, the researchers developed an apparatus for instantly measuring and recording wind speed that has attracted much international attention. The results of the Botswana study should assist the Ethiopian researchers who are continuing work on the rotor.

Moreover, says project leader Richard Carothers, the research fostered the Government of Botswana's interest in continuing the search for low-cost energy sources based on wind power and enabled local technicians to gain expertise in this field of research.

*Michelle Hibler*





Into the dry mouth of a slowly wasting infant, a mother spoons a weak, lukewarm tea brewed from the tiny buds of a lime tree. For children sick with diarrhea, "lime bud tea" is a folk remedy honoured by time — if not justified by effectiveness. Before diarrheal disease became known by its scientific name of gastroenteritis, its purging and weakening symptoms were ascribed to "loose bowels." The traditional remedy—to "bind the belly"—is to feed the child a pap made from wheat flour or arrowroot starch. It's only when none of these remedies works that many Trinidadian parents take their children to see a doctor. By then, it's often too late.

"I've seen people coming into the ward carrying a dead child — totally dehydrated," says David Bratt, a University of the West Indies (UWI) professor who teaches pediatrics to interns at the Port of Spain General Hospital. The father of three young children himself, Dr Bratt is disturbed by the statistics about gastroenteritis in Trinidad. The gloomy picture they present

led him to take up the fight against this child-killing disease as if it were a personal cause. On his rounds of the ward, especially during annual epidemics, he sees scores of dehydrated children whose bodies, wasted by diarrhea, have lost fluids and electrolytic salts. If not replaced, this loss results in shock and eventually death.

Ward 54, on the fifth floor of one hospital building, was intended for 40 children with infectious diseases. It now holds 60 to 66 cribs. During an epidemic there may be up to 90 children, lying sometimes two to a bed. At any time, a quarter of these children might be taking intravenous fluids to fight dehydration. All Trinidad calls it "the gastro ward," with a collective shudder. The reputation of "the gastro ward" was made between 1973 and 1976, when an average of 122 children died there annually — a mortality rate of 6.1 percent. In 1980, 62 of the 3270 children who were admitted died there of gastroenteritis, the lowest number and ratio of deaths (1.9 percent) since 1972.

Ward 54 is only a part of the whole gastroenteritis picture in Trinidad and Tobago. In the two-island Caribbean republic of 1.1 million people, there are 400 000 children under 14. The disease kills some 250 of them each year, one-quarter of the deaths in that age group. Nobody is sure how many more are made ill by it, but the PanAmerican Health Organization (PAHO) estimates that, throughout the Americas, children under five have four to eight attacks of diarrhea a year.

The fight against the disease has to move beyond the walls of Ward 54 and out of Trinidad hospitals. Dr Bratt's idea is to take the fight to the homes and to show parents, not only how to prevent gastroenteritis, but how to treat their children in the early stages of the disease.

The idea is to promote oral (instead of intravenous) rehydration as a household remedy, a therapy that has proven effective in Central America and Asia in treating diarrheal diseases. But in Trinidad, this notion is not only rejected by many health professionals, but is



Tobago government, UWI, and IDRC, began with the training of 12 hospital and public health nurses. With Dr Bratt and other like-minded doctors and nurses, these dozen would actively promote oral rehydration within the health care system, and among the people who come for attention to hospitals and health centres.

In January 1981, as part of the ECMS project, an oral rehydration unit began operating in the casualty ward of the Port of Spain General Hospital. Its equipment consists of one metal desk, some chairs, an electric fan, a notice board, a scale for weighing babies, rolls of paper towels, and some plastic jugs. At the desk, Nurse Cynthia Scipio fills in a questionnaire while a young mother coaxes an 18-month-old girl to suck on a straw from liquid in a plastic cup. Oral rehydration is in progress.

Describing how it works, Nurse Scipio — one of three nurses who run the unit 13 hours a day — rips open a small aluminium foil envelope labelled “Unicef Oral Rehydration Salts.” She shakes the salts into a sterilized empty one-litre container, adds clean water, and stirs. This is the glucose electrolyte solution (GESOL) comprising glucose, sodium chloride, potassium chloride, and sodium bicarbonate. “It doesn’t taste too nice,” the nurse smiles, glancing at the child on the mother’s lap. “It tastes like tears. Children over two don’t like the taste, so we advise the parents to give them coconut water and Coca-Cola.” She explains that coconut water is a glucose electrolyte solution, and Coca-Cola contains sodium bicarbonate.

The mother and child spend two hours in the unit. The nurse weighs the child before and after giving it a cup of GESOL, and notes how much liquid the body absorbed. This is part of the screening process that begins with the casualty doctor who first assesses whether the child is too dehydrated for oral rehydration. The unit handles only those children, aged between 3 and 24 months, who are “mildly to moderately dehydrated.” More serious cases are warded for intravenous rehydration. In its first three months, the unit saw 145 “project cases,” and gave advice to more than twice that number. After the first cup of GESOL, the interviews, and the weighing, the mother is sent home with her child, a packet of Unicef salts, and a sheet of instructions on how to hygienically prepare and serve GESOL using commonly available containers. Another stencilled sheet lists “danger signs” and advises that the child be rushed to a doctor if the diarrhea gets much worse. The mother is also told to bring her child back for examination in 24 hours.

According to Dr Bratt, gastroenteritis is a “self-limiting disease. After five to six days, it either stops, or the patient dies.” There’s no known way, he adds, to stop the diarrhea or to eradicate the *rotavirus* whose infection is often the cause. The diarrhea represents an attempt by the body to get rid of poisons,

but the discharge also includes fluids and vital salts. Oral rehydration, by means of GESOL in a cup, is a cheap and simple way to replace the fluid and salts, without the need for hospitalization and intravenous equipment. Nurse Scipio points to the “more informal” setting possible with oral rehydration, and to the benefit of “bringing the relative involved with the patient. The mother is able to share her experience with a neighbour, so it’s better for the community.”

In the hospital, not only are infant diarrhea victims routinely warded and hooked into intravenous equipment, but parents are not permitted to visit them. Dr Bratt is also strongly opposed to the frequent use of antibiotics and antispasmodic drugs, and the prescription by many Trinidad doctors of a concentrated glucose solution (without the salts). Antibiotics, he argues, are only effective in the 10 percent of gastroenteritis cases that are caused by the *Salmonella typhimurium* bacteria. Antispasmodics, which slow down the muscles that expel the wastes, appear to check the diarrhea, but leave unsolved the problem of discharging the poisonous wastes.

The project raises a flag for individual involvement in and responsibility for the preservation of health. Dr Bratt contends that up to 85 percent of diarrheal children could be treated safely at home by their parents. Of the children seen in the first six months of the project, only 12 percent failed to improve with oral rehydration and required hospitalization.

Using “gastro,” with its ever-looming spectre of infant death and suffering, as an attention getter, the current phase of the project is focusing on maternal and child health. A planned media campaign will promote breast- instead of bottle-feeding, and will drive home the importance of boiling water for drinking. An attempt will be made to link the causes of the disease to poor environmental sanitation — the lack or shortage of piped water, the lack of proper waste disposal, and the use of streams contaminated by flooded sewers.

As it’s important to begin oral rehydration early in the disease, parents will be shown how to recognize the illness in time for the therapy to be effective. Six months after treatment, parents will be visited to see what, if any, improvements have taken place in their child care practices.

“I think it’s wrong to assume Trinidadian parents are inadequate,” Dr Bratt says. “They might lack education, but that’s because a good rapport with them hasn’t been established.” A campaign is underway to create that “rapport.” The aim is to show parents how by their own actions they can prevent the scourge of “gastro,” and to provide them with a handy and trusted remedy to treat it, if and when it happens. □

*Lennox Grant is a Trinidadian journalist.*

*Sugar, salts, and clean water: a recipe that could save the lives of hundreds of Trinidadian children suffering from gastroenteritis*

LENNOX GRANT

## THE SIMPLE SOLUTION

also problematic in practice. Among most doctors, traditional household remedies stand discredited; the suggestion of a new one is regarded as at least outlandish. Yet oral rehydration, as a therapy to be performed by mothers in the home, cannot be popularized without the approval and cooperation of the health care network of doctors, nurses, health visitors, and the staff who run hospitals and health centres. This calls for more than the skills of a pediatrician and the conviction of a believer; it calls for salesmanship. For oral rehydration to be accepted as a self-help remedy in the home, Dr Bratt needs to show that it works.

In November 1980, under the auspices of UWI’s Eastern Caribbean Medical Scheme (ECMS), Dr Bratt launched a 19-month project to demonstrate that oral rehydration — administered by mothers in the home — could lessen the suffering from gastroenteritis and reduce the number of victims admitted to already overcrowded, under-equipped, and understaffed hospitals. The project, supported by the Trinidad and



**A** Nepali student studying overseas recently returned to Kathmandu on a brief visit to collect information for his dissertation on the economics of fertilizer use on rice and wheat in Nepal. His university library had been unable to locate suitable literature sources. He turned to the Nepal Agricultural Documentation Centre (NADC) for assistance.

After defining the scope of his requirements, the library's staff guided him through a literature search of their collections. They also translated his topic into a search question that was used to interrogate the data base of

much has been written since 1951 when Nepal opened its borders to the world, finding out what still existed — and where — constituted a research program in itself.

In fact, while many development projects, particularly in hill farming, had been carried out in Nepal, information on them was not organized or disseminated. The main reason was the lack of library facilities. Until 1951, public libraries were illegal in Nepal, and only after political reforms in 1958 did library development get underway. The main impetus did not come until 1975 with the publication of a Ford Foundation

## INFORMATION ACROSS THE MOUNTAINS

*The Nepal Agricultural Documentation Centre has put the country's researchers in touch with one another, and with the rest of the world*

RAM PRAKASH YADAV  
and CLIVE WING



FAO's International Information System for the Agricultural Sciences and Technology (AGRIS) in Vienna. The result: a 65 item bibliography.

Journal articles cited in the bibliography that were not held by NADC were traced using the Union List of Serials in Agricultural Libraries and photocopies were ordered from the British Library Lending Division. Having obtained sufficient data so quickly, the student was able to visit key personnel and compose a draft of this thesis before leaving Nepal. Like many users of NADC's information system, he was surprised at how easy it is to obtain exact information.

Three years ago, he would not have been so fortunate. Undertaking agricultural research in Nepal, as in many of the least-developed countries, was tantamount to hunting for needles in haystacks. Although

report that advocated a central government library system.

The NADC was established in 1978 under the auspices of the Agricultural Projects Services Centre (APROSC) — an autonomous body for project development, evaluation, and support — to organize national literature and provide information on request. From a modest beginning, and with support from FAO and IDRC, it quickly expanded to become both a national centre and AGRIS' input centre and liaison office in Nepal.

Today, NADC is the only source of national rural development and agricultural documentation in Nepal. Other libraries exist, but none have collected and preserved non-conventional literature — unpublished technical reports, seminar papers, government documents, theses and mimeographed papers — that map



Nepal's modernization efforts and priorities.

This collection — the most complete ever assembled in Nepal — is the foundation of NADC's information services. The system and services are simple but effective. Local producers of agricultural information deposit their reports with NADC, which indexes them, inputs bibliographic details to AGRIS, and makes their existence widely known to the national agricultural community. The system works because users realize that the output — what they require — can only be obtained if they provide the input.

The main vehicles of information

contents pages of current journals and providing users with a full copy of any article of interest was started some time ago. Linked to this is the photocopying of citations on specific subjects from the monthly AGRIS output bibliography, AGRINDEX. This service is tailored to the exact needs of recipients. Requests for full copies of cited material are supplied using the British Library Overseas Photocopy Service.

NADC is now concentrating on organizing the collections of other agricultural libraries, in most cases attached to research farms, to ensure their effective use. A fledgling

record of local intellectual efforts and make the materials readily available to local and foreign users. In recent weeks, this information has included topics as diverse as people's participation in development projects in South Asia, average dung production of local hill cattle, and fuelwood consumption in various regions of Nepal.

The only centre in Nepal collecting a body of information whose importance is matched by its elusiveness, NADC has risen to a position of prominence among the country's libraries. The services it offers are unique in a country where many library collections



dissemination have been a topical Occasional Bibliography series — 10 issues have been published to date — and a monthly accessions list, both of which are widely and freely distributed. These are now augmented by the Nepal Agricultural Abstracts, based upon nonconventional literature and journal articles, and the Nepal Agricultural Bibliography. Compiled for the most part from NADC's current AGRIS input, the Bibliography contains 2484 references.

Publications such as these are the most effective means of disseminating national research results in Nepal, especially as some recipients live in extremely remote mountain areas, seven days distant from Kathmandu, with the postal service their only means of communication.

A Scientific Literature Service (SLS) that involves photocopying the

agricultural information network has evolved as NADC staff visit these widely scattered libraries, catalogue their collections, create union catalogues, and arrange for the purchase of books and journals. There are no librarians in these libraries. Information and requests for information are channeled through farm personnel. Recently, NADC brought these "sometime librarians" to Kathmandu for a workshop devoted to methods of organizing their libraries with the minimum of time and effort.

An increasing number of information requests come from overseas as a direct result of Nepal's input to AGRIS. This is good news for local agriculturalists whose research results were previously unavailable in the rest of the world. All documents produced in Nepal are put on microfiche to provide a permanent

were — and still are — kept under lock and key. NADC's willingness to reach across the physical barriers of Nepal's rugged topography and share its resources and expertise among the agricultural community is an important contribution to the country's development efforts.

The documentation centre's greatest mark of success, however, is its fully professional and trained staff who have initiated simple and effective programs that are now self-sustaining. The experience and knowledge they have gained during the past three years mean that a planned and structured growth of NADC is assured.

*Ram Prakash Yadav and Clive Wing are Executive Director, APROSC, and former IDRC consultant to NADC, respectively.*



## Smoking hazardous

Wood smoke can be a danger to your health, according to a paper published by the energy task force of the United Nations Environment Programme (UNEP). That's bad news for the vast majority of people in the Third World for whom firewood is still the only available source of fuel for cooking and heating.

The paper says studies have shown that wood smoke contains a total of 37 pollutants, carcinogens, and toxic agents.

In rural Fiji, a study supported by IDRC indicates sustained exposure to a smoky atmosphere is a possible cause of chest complaints and eye irritation. Eighty-five percent of women interviewed in the Fiji study wanted better cooking facilities. UNEP agrees, and its own energy task force calls for a thorough assessment of the social, economic, and environmental impacts of firewood production and use. It also stresses the need for improved smokeless stoves that would help to reduce the health hazards and would burn fuel more efficiently.

## Biofuels proposed...

Scientists the world over recently have developed a strong interest in weeds. Plants that were once considered pests have suddenly become potentially important crops — all because of soaring oil prices and uncertain supplies.

The plant kingdom contains many natural oil sources. There are the obvious ones, such as linseed and rapeseed (canola), which are already under investigation as potential sources of diesel fuel. And there are the less

obvious ones: the California jojoba bush, which yields a substitute for sperm whale oil; the gopher plant, which produces a petroleum-like oil; and the Brazilian *Cobaifera langsdorfii* tree, whose sap is almost identical to diesel fuel. Even the pesky milkweed, which plagues North American farmers, produces a latex that has petrochemical potential.

Biochemist Prof. Hamish Rattray, of the University of Guelph, Canada, predicts the day may well come when some of these oil-producing weeds will be cultivated on "fuel farms". Such home-grown oil production may be most suited to the rural tropics, where energy demand is relatively low.

Prof. Rattray estimates that to meet North America's insatiable demand for oil would require close to 300 million hectares of inedible oil crops — more than double the total hectage for all types of agriculture in the U.S.A. today.

## ... and deposed

The possibility of producing liquid fuels from hydrocarbon crops such as *Hevea* — the source of rubber — has attracted much interest in recent years. But, warns Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), these fuels could cost several times as much as other liquid fuels.

A study conducted by CSIRO on various plant species that produce a resinous extract which can be converted to hydrocarbon fuels concluded that none of the crops investigated would be commercially viable as fuel crops. *Hevea brasiliensis* is presently the only hydrocarbon-producing crop cultivated, but the

rubber it produces is worth five times as much as crude oil. Guayule, a shrub that grows in the southwestern U.S.A. and northern Mexico, also produces resin that could be used to manufacture fuels, but which is now used as a rubber substitute and is worth much more in that application.

Of hundreds of other potential plants surveyed, CSIRO found only a small number that were potential crop species. None are presently cultivated, and considerable research and development would be needed to bring them to the stage of commercial development.

The study estimates that it would cost US\$100 to \$150 to produce a barrel of oil from resin extracts. Arabian light oil currently sells for \$32 a barrel in Australia and oil from rapeseed (canola) costs \$75 a barrel.

## Biter Bit

A three-pronged attack on the mosquito is underway in the South Pacific in an effort to control the insect responsible for the spread of diseases such as malaria, yellow fever, dengue fever, and filariasis.

The plan is to use two of the mosquito's natural enemies, plus an environmentally safe larvicide in an experimental program on several small islands. A tiny parasitic worm called *Romanomermis culicivorax* that is harmless to most life forms but lethal to mosquito larvae, will be introduced into the mosquito breeding grounds, together with a recently discovered strain of bacteria, *Bacillus thuringiensis israeliensis*, which is also lethal to mosquitos but safe for humans and other animals. Drinking

water will be treated with Methoprene, a pesticide recommended by the Expert Committee on the Safe Use of Pesticides of the World Health Organization.

An important part of the project will be an education program to teach the villagers the importance of eliminating mosquito breeding sites and other sanitation measures. The project is being carried out by the South Pacific Commission in cooperation with Memorial University of Newfoundland, Canada, which is a world leader in this field of research. IDRC will pay two-thirds of the cost under its program of support for cooperative research between Canadian institutions and developing countries.

## A guide for the water perplexed

To get money for water and sanitation projects, one has to say the right things to the right people, at the right time. The World Health Organization has therefore written a special booklet for developing-country government officials, advising them on how to prepare proposals for potential funding agencies.

The WHO's Unit for Global Promotion and Cooperation for Water Supply and Sanitation (GWS) has drawn up a standard data sheet. Details of the scope, background, agency responsibilities, internal and external inputs, costs, and benefits are entered on the form for easy comprehension by appropriate funding agencies, reports *Waterlog*, an Earthscan publication.

Interested government officials can request the booklet from Unit Manager, GWS, World Health Organization, 1211 Geneva 27, Switzerland.



**Nut for burning**

Scientists in the Philippines are investigating a recently rediscovered source of energy that grows on a tree, according to the Centre for Science and the Environment (India).

The tree in question is called *Pittosporum resiniferum hems*, but is locally known as the petroleum nut tree — because the nuts that it produces twice yearly smell, and burn, like petroleum. A kilogram of nuts gives about 70 grams of oil when pressed. The oil contains hydrocarbons which are rarely found in nature, and burns with a smoky flame at a temperature of about 300 °C.

The nuts are so flammable that, even when freshly picked, they can be lighted with a single match. The government's Bureau of Plant Industry (BPI) is coordinating a major five-year research program that will include setting up experimental plantations in various parts of the country.

Surprisingly, the properties of the petroleum nut have been known since the early 1900s, and it was even used by occupying Japanese forces during the war. But with modernization and the growth of the electrical grid, the villagers who once used it almost forgot it.

"The plant will not solve the energy crisis," says Dr Lydia Crisostomo, of BPI, "but we must plant this tree wherever we can, as it will make a contribution to solving the rural energy problem."

**Recycling with irradiation**

Instead of creating disposal problems, sewage could become an important supplemental feed for cattle, sheep, and other ruminants. So say researchers from New Mexico State University, Albuquerque, New Mexico, U.S.A., who conducted a six-year study on the use of irradiated sewage in animal diets.

Sludge was collected from primary treatment plants in the cities of Albuquerque and Las Cruces, irradiated to kill pathogens, and dried. Studies showed that the energy and biological

value of the sewage solids were about the same as for cottonseed meal. Cattle were then fed the solids as supplemental feed for four years with good results. Tests have shown that supplemental feeding increased calf weights at weaning and improved the rebreeding of cows.

The researchers also put to rest any fears of health hazards. Irradiation does not make the sewage radioactive, they say. The risks posed by possible toxicants in the sewage were also studied: there is no evidence of hazard to animal or human health.

According to the International Atomic Energy Agency (IAEA), use of sewage and other wastes as animal feed could reduce fuel costs in agriculture while increasing much-needed food supplies.

**Sanitation lagging**

Although ambitious plans for drinking water supply have been laid in many many developing countries, targets for the provision of sanitation in rural areas are far behind.

The picture of lagging sanitation services emerges from a recently published survey of national plans and policies of 116 developing countries, the *International water supply and sanitation decade directory*. The reason most commonly cited for the shortfall is lack of technical personnel and finances.

The directory shows how many people are currently served with proper drinking water supplies and proper means of sanitation, and analyzes the current situation. It also gives a nation-by-nation review of the importance attached to this area. The policies of major donor agencies are also included.

The various UN agencies involved in the preparation of the directory consider that it is the baseline document for monitoring each country's progress towards achieving the goals of the International Drinking Water Supply and Sanitation Decade 1981–1990.

Developing-country journalists and nonprofit organizations can obtain the 407-page directory free of charge from Mr. I.

Ahman, gws, World Health Organization, 1211 Geneva 27, Switzerland. Others please contact: Thomas Telford Ltd., 1-7 Great George St., London SW1P 3AA, U.K.

**Speeding seeding**

A simple mechanical seeder being developed by the Asian Institute of Technology (AIT) in Thailand may help reverse the trend of declining soybean production in that country and free women from a very onerous task.

Although the total land area planted to soybeans in Thailand has increased sevenfold over the past 20 years, yields per hectare have actually declined by about half.

Soybean is often a second crop after rice, planted in the stubble to take advantage of residual soil moisture. This method unfortunately also creates labour problems, as farmers must thresh the rice harvest and plant the soybeans at the same time. They have therefore resorted to broadcast seeding which is quicker, but produces less uniform seeding and lower germination rates — and subsequently lower yields.

In the traditional hand-sowing method — a time-consuming task largely performed by women — two to four seeds are placed in a hole opened with a stick or trowel close to the rice stubble. The stubble provides a simple guide to sowing density (about 200 000 seed "hills" per hectare), and allows the soybean roots to penetrate the soil by following the decomposing rice roots. It is also thought that the decomposing roots provide an additional source of nutrients.

AIT's researchers have been able to cut seeding time by 20 percent, while allowing the sower to stand rather than squat, by using a prototype mechanical seeder, a hollow staff-like device that opens the soil and meters two or three seeds into the hole.

With a grant from IDRC, AIT is now improving the seeder's design and carrying out further tests in farmers' fields. Blueprints will then be distributed to farm equipment manufac-

turers in the country's soybean growing regions.

**Children: paying with their lives**

What's a child worth? Less than US\$100 says the 1981/82 *Report on the state of the world's children*.

Spent wisely on each of the poorest 500 million mothers and children, that amount could have provided basic necessities and saved the lives of 17 million children who died last year. It could also have helped to slow down population growth and accelerate economic growth. But, according to James P. Grant, Executive Director of the United Nations Children's Fund (Unicef), "it proved too high a price for the world community to pay. And so, every two seconds of 1981, a child paid that price with its life."

The report does not forecast any improvements for the coming year. "The economic trends indicate that progress against poverty is not slowing down but is being thrown into reverse", says Grant.

This year's goals are the same as last year's — reduce infant deaths to five percent, increase life expectancy to 60 years, and provide four years of schooling for all children. Reaching these goals is not a question of possibilities, says Grant, but of priorities. It would cost less than what the world spends on alcoholic beverages each year, for example, or the same amount that is spent every six weeks on increasing military capacity.

The report appeals to the world community to respond to the "silent emergency" of children's mortality. It also warns that the failure to do so could jeopardize the success of population control programs. "Whether today's world population of 4.5 billion eventually stabilizes at 10-11 or 13-14 billion sometimes around the end of the next century depends heavily on what happens to birth rates in the last two decades of this century," says Grant. And what happens to birth rates in this century depends on the survival of today's children.





BOB STANLEY

## HARNESSING

**R**esearchers and farmers working together in the dry zone of Sri Lanka have developed a cropping system that produces two, or even three harvests in a year, where before they obtained only one.

The dry zone is the poorest region of this island nation, yet it was once the heart of the country—site of two capital

cities, and home of powerful kings. It was also a fruitful land that produced rice enough for all its people, and plenty for export.

The key to the dry zone's past prosperity was a remarkable network of irrigation systems, begun more than 2000 years ago, that made use of every drop of water. But with the end of the great kingdoms the

systems fell into disrepair. Colonial rulers promoted the cultivation of export crops — such as rubber, spices, coconuts, and tea — on plantations in the humid zone.

For centuries the dry zone and its people were all but forgotten, and Sri Lanka became an importer of food.

Many villages built beside the ancient

irrigation tanks, however, continued to practice the traditional agriculture. But when the rains were poor, as they often are, the tanks dried up early, there was no rice, and the farmers could barely scrape a living from dryland crops.

Walagumbahuwa is one such village, and it was here that Sri Lankan researchers came several years ago to persuade the





*Facing page, clockwise: The Mahaweli irrigation scheme will bring water to 360 000 hectares of Sri Lanka's dry zone. At a research station, experiments are under way to breed high-yielding, early maturing rice varieties. Grain legumes and vegetables can be planted after the rice harvest.*

*This page, left top: Farmers continue to grow upland crops such as chilies around the old irrigation tanks. Bottom: In Walagumbahuwa buffalo are used to thresh the rice harvest. Right top: Neill McKee films the coming monsoon. Bottom: Fields are being ploughed to make way for the next crop.*



## THE MONSOONS

farmers to try a new way. Their secret weapon were new high-yielding rice varieties, developed at IRRI (the International Rice Research Centre), that mature in only three months at any time of the year — so long as they have water. The project was supported by both IRRI and IDRC.

With this rice the farmers can plant at the start of the rains in October and save

the rainwater in their tank to irrigate a second crop planted in March, after the first has been harvested. In a good year, a third crop of legumes and vegetables can be planted in July. But first farmers had to be convinced that change was necessary, and that the experiment would work.

To help the villagers overcome their natural caution, the researchers

invited them to become partners in research — and moved into their village to work alongside them.

IDRC Filmmaker Neill McKee visited Walagumbahuwa several times, at different seasons, to capture this unusual partnership on camera. The result is a new IDRC film, *Harnessing the monsoons*, that provides a rare insight into the practical applica-

tion of agricultural research right on the farm.

It is research designed to help farmers develop new production methods that are within the resources available to them, that will improve their quality of life without upsetting the best traditions of 2000 years.

*Harnessing the monsoons: Improved cropping systems in Asia, 16 mm, colour, 27 min.*



# FUTURE FOOD

## CANADA AND THE WORLD

ROWAN SHIRKIE

In the populous, resource-scarce world of the future, Canada may be one of a few countries deciding who eats and who starves. At the same time, Canada may also be fighting to preserve its own food-producing capabilities.

But this "reconnaissance of the future", according to Gerald O. Barney, author of the *Global 2000 Report to the President*, "is not a prediction of what will happen, but an assessment of what might happen if we proceed along our present course." Barney and associates presented the Global 2000 report, a 3-year million-dollar computer modelling study of probable changes in the world's population, natural resources, and environment through the end of the century, to former U.S. President Carter in 1980. Late last year, Dr Barney delivered a special Canadian interpretation to a group of sponsoring government agencies as an aid for long-term planning in Canada.

The original Global 2000 study suggested that, if present trends continued, the world in 2000 would be more crowded, more polluted, less stable ecologically, and generally more vulnerable to disruption. And for the people of that world — particularly the poor in developing countries — the Global 2000 scenario was one of a life even more precarious than it is now. Of the estimated 6.35 billion people occupying earth then, almost 80 percent of them will be in the less developed countries. And they will continue to be poor. Per capita gross national product (GNP) will

average less than US\$6000 in the developing countries, and \$8500 in industrialized countries (\$11 000 in advanced industrial economies).

"In the midst of these rather gloomy global developments," *Global 2000: implications for Canada* says, "Canada can be expected to face a relatively bright future: her resources are evidently ample to meet the needs of a population even in excess of 30 million, although it is to be realized that in comparison with global demands, the supplies are totally inadequate." And it is apparent that Canada will feel increasing pressures to supply more basic resources to the rest of the world — food, energy, forest products, and minerals, "which in turn will place increasing stress upon land, air, and water resources within the country."

Can Canada withstand the pressure, managing her resources rationally to provide sustained yields — particularly of food — into the future?

Planners at Agriculture Canada believe it can. The department is basing its future development strategy largely on continued ability to provide increasingly valuable food exports to a hungry world.

*Challenge for growth: an agri-food strategy for Canada* draws on Global 2000 data that indicates growth in demand for food will raise per capita consumption 15 percent worldwide. This demand will be met only by intensifying expensive means of production, driving food prices up 21-63 percent

by the year 2000. "The poor," as Gerald Barney puts it, "will be priced right out of the market."

In a sense, Canada may have already moved toward a decision about who eats adequately. "There is a growing consensus," the agri-food strategy says, "that Canadian agriculture may be emerging into an era of much higher growth, propelled from the export sector." And the strategy identifies oil-exporting and rapidly industrializing developing countries as offering the greatest opportunities for rapidly developing food markets — Mexico, Venezuela, Algeria, South Korea, and Brazil. Meanwhile, per capita food consumption in South Asia, the Middle East, and the less developed countries of Africa will "scarcely improve or will actually decline below present inadequate levels," according to Global 2000 projections. The number of people whose food intake will be below the FAO minimum requirements level will increase from 500 million now to 1200 million as the world enters the 21st century. Barney and associates ask: "How can Canada avoid the political pitfalls of being a major food surplus nation in the coming years of food insecurities and potentially disastrous shortages?"

There are other pitfalls that lie in the path of future food production in Canada. The Global 2000 study notes that as demand rises, the production increases necessary to meet it become more difficult to achieve. "Most arable land is already under cultivation and the land that is not will be quite expensive to develop. Increased use of energy-intensive inputs can help increase yields, but at diminishing returns in many exporting countries and at increased production costs everywhere." With the increased export opportunities comes a danger that demand might ultimately overwhelm productive resources. Agricultural and environmental scientists in Canada point out that only 0.5 percent of Canada's land is prime agricultural land with no significant limitations for cropping. Almost half of this land is in areas where losses to urban spread and non-farm uses are the highest in the country.

Farming occupies about 69 million hectares of land in Canada. An additional 60 million hectares have some productive capacity, but less than 12 percent of this is deemed to have any significant potential. Problems are beginning to occur on existing farmlands: loss of up to 50 percent of the organic matter in many soils; salt build-



Above: wheat harvest on the Canadian prairies — will exports increase or decrease? Facing page: Food consumption in the poorest countries is expected to decline. Here, a market in Bangladesh.



up cutting yields on 10 percent of prairie grain-growing lands; erosion; waterlogging; and deterioration caused by pollution in the form of chemicals or acid rain. One eminent soil scientist, Dr Fred Bentley of the University of Alberta, has suggested that the various factors may already have accounted for yield losses of up to 40 percent on Canadian lands. Improved agricultural technologies using new plant varieties, chemicals, and management practices have so far more than offset the declines, but these yield-increasing trends have reached a plateau from which productivity will drop unless the resources are more rationally managed.

Others have pointed to the hazards of "mining the soils" for food export. The loss of the most basic of food production resources — the very soil itself — has been estimated to have been as high as 22 tonnes per hectare in the U.S.A. seven years ago. No reliable data exist for comparable productive land in Canada, but some studies have estimated losses at 20-80 tonnes per hectare. Farmers capitalizing on rising demands for food substituted cheap fertilizer for traditional soil building and rehabilitating crop patterns. Soil conservation experts warn that short-term gains have been traded against the longer-term sustainability of production.

The prospects for increased production and export of cereals — the most important component of food supplies — given in the Global 2000 report are sketchy and seem to conflict with other Canadian analyses. The only specific projection given for Canada shows Canadian wheat exports (which represent slightly less than half of grain exports) increasing from 11.75 million tonnes in 1970 to 15.28 million tonnes in 1985 (a 30 percent increase) and declining to 7.31 million tonnes by 2000 — a decrease of 52 percent over the last 15 years of this century. But the Global 2000 study does not attribute the decline to any of the risk factors such as soil deterioration or climate change that it warned could constrain production: "The surplus productive capacity of the traditional exporters — particularly Canada, South Africa, and Australia — is projected to decrease beyond 1985 as a result of growth in domestic demand."

"I find this projection most puzzling," says Dr L.H. Shebeski, former dean of Agriculture at the University of Manitoba and now a consultant on agricultural development. "Demand for food within Canada will go up very little over the next two decades. ... Therefore, if there is to be a reduction in Canadian exports, it must result from a reduction in production and, in my opinion, there is simply no logical reason for expecting such reduction." Dr Shebeski notes Canadian forecasts, including Agriculture Canada data on which the Global 2000 model drew, that see Canadian productivity rising by 65 percent by the turn of the century. Grain surpluses for export are expected to dou-

ble over that period, rising from present levels of about 18 million tonnes to 36 million tonnes.

However, this could be close to the maximum agricultural production which Canada is capable of achieving, assuming a high level of management on all agricultural lands. Agriculture Canada pegs maximum production at 62.2 million tonnes, exportable wheat at 25.1 million tonnes, and makes no mention of overall cereal surpluses. But should the resources be exploited to their maximum?

As the Global 2000 study sees it, Canada has at least two major resource management options: "... it can sell to the highest bidder, or it can demand disciplined action on the part of resource — and food — importing nations as a condition for access to Canadian resource supplies. By demanding a thoughtful and responsible approach to sustainable economic development, Canada could exert considerable pressure and influence with only marginal amounts of resources (on a world scale) if it demonstrates that its own resource management policies meet these goals. An approach to agriculture that recognizes and restricts the export of topsoils would be one very constructive such example."

Barney recommends a proposal originally made in 1975 by Lester Brown of the Worldwatch Institute whereby Canada would join with the U.S.A. to formulate a North American food policy that establishes "explicit guidelines for responsible, cooperative behaviour in a world of food scarcity, ensuring ready access to the North American food markets for countries that are following internationally agreed upon strategies in food and population, and when supplies are low, restricting access for those that are not." But according to some experts, using food as leverage for change in developing countries in concert with the U.S.A. may be as full of political pitfalls as only marketing where trade opportunities are greatest.

In the end, *Global 2000: implications for Canada* may simply have added a greater degree of complexity to the problems of Canadian food resource management in the future and raised more questions than it answered. But as Barney points out, Canadians must begin to address these and other questions because as a nation that enjoys a relatively secure resource future, lacks the "ideological obsessions of the superpowers", and plays a respected non-threatening role in world affairs, Canada has a unique opportunity to provide a "new model of development" and leadership. Being endowed with resources greater than its needs brings with it a responsibility for careful stewardship. And as Barney notes, "If Canada doesn't do it, who will?" □

*Global 2000: implications for Canada*, by G.O. Barney, P.H. Freeman, and C.A. Ulinski, Pergamon Press, 1981. (In *Canada: Suite 104*, 150 Consumers Road, Willowdale, Ontario, Canada M2J 1P9.)

## BEYOND FOOD

Apart from food and agricultural resource development issues, *Global 2000: implications for Canada* brings forward a number of areas where the country will have to carefully examine and modify policy. A number of those that might affect relations with developing countries are highlighted below:

- Canada is largely a resource-exporting country and therefore needs trading partners as a base for a strong economy. The report notes: "The biggest threat to Canada may be the disturbance of its economy because of dislocations in the global economy." Vulnerability to balance of payment problems, protectionist trade policies, and other shocks will grow. In an increasingly interdependent world, local disturbances are more quickly transmitted throughout the global system.

- Immigration pressures will increase — should Canada have an explicit population policy, and what vision does she have for the future cultural mix?

- Internal tensions generated by resource development policies will increasingly affect relations between regions. Canada "seems weak in policies and resource management programs that ensure stable trade and continuing productivity..."

- "Canada's principal vulnerabilities as well as its principal opportunities lie in the primacy of its relationships with the United States."

- Canada is in a "unique position to play an important role in world development. It is respected by the South as well as by the North and, like the LDCs, has pursued a foreign policy that emphasizes multilateral relations." Canada will also acquire increasing bargaining power based on its resource wealth.







# SENEGAMBIA

## BUILDING ON THE PAST

JEAN-MARC FLEURY

**P**rofessor Boubacar Barry received an IDRC Professional Development Award in 1981 to write a history of Senegambia from the 15th to the 20th century. According to Dr Barry, this overview of the economic, political, and social aspects of the region's evolution is essential if planners are to formulate regional development strategies. "In fact," says Dr Barry, "the entire region is threatened by desertification and only a realization of the necessity of regional integration — economic, social, and political — will enable us to lead a successful battle against the desert."

Jean-Marc Fleury interviewed Dr Barry in Dakar, Senegal.

Legend has it that to create Gambia a British gunboat sailed as far as it could up the Gambia River. A gunshot fired forward determined the total length of the country (325 kilometres), and one to the left and another to the right demarcated its width, from 20 to 50 kilometres.

This tiny West African country, completely hemmed in by Senegal, has been one of the most blatant anachronisms of the African continent. Gambia posed a serious problem for Senegal by cutting off direct access to Casamance, the larger country's most fertile province, off whose shore oil discoveries have been made. The Gambians, however, have managed to make the

*The confederation of Senegal and Gambia: a first step to abolishing the boundaries to development in West Africa?*

best of their situation. Peanut farming, tourism, and import duties levied on vast quantities of consumer goods for sale — or smuggling — to neighbouring countries have provided Gambia with a stable economy.

On January 1, 1982, the two nations merged in a confederation known as Senegambia, bringing to an end 17 years of discussions. Under the agreement, Senegal and Gambia remain sovereign nations. They are, however, integrating their security forces and their communications networks, coordinating their foreign policy, and undertaking to form an economic and monetary union.

For Boubacar Barry, a history professor at the University of Dakar and Secretary-General of the Association of African Historians, the union of the Gambia and Senegal is but a first step towards the creation of the "Greater Senegambia."

"In current political terms," he says, "Senegambia consists of the Republics of Senegal and Gambia. Historically, the Senegambian region is of far greater dimensions, including the whole of the Senegal and Gambia River basins, from their sources to their mouths."

"Greater Senegambia", then, would include not only Senegal and the Gambia, but vast chunks of Mauritania, Mali, Guinea, and all of Guinea-Bissau. "This Senegambia has always existed," states Professor Barry. "Although its peoples have different names: Peul, Serer, Wolof, Toucouleur, Diola, Mandé, and so on, we can see that their social and political structures are about the same."

"Prior to the 15th century, because it is adjacent to the ocean and the ocean did not yet play an economic role, this region was no more than an appendage, the cul-de-sac of West Africa, whose centre of gravity was the western Sudan at the loop of the Niger River. But everything changed after the fall of the Mali kingdom in the 15th century. The Mali empire, on the wane on its home ground, fell back to the coast and survived for centuries along the banks of the Gambia River."

After that pivotal century, Senegambia began to gain importance as Atlantic trade, which had become more important than trans-Saharan trade, expan-

ded. At times, such as under the rule of the Wolofs and at the time of the invasion of the Peul conqueror Koli Tengela, it even constituted a single entity. The coastal kingdoms, however, armed by the Europeans, subsequently gained strength and formed a mosaic of small States.

In the 17th century, Atlantic trade had a corrosive effect on African societies, particularly as a result of the slave trade. "Warlike aristocracies established themselves in each of the small coastal kingdoms", says Dr Barry. "Any union was impossible because man-hunting was their sole activity."

"The only pan-Senegambian political force to emerge then was Islam", continues Barry. "Throughout the 17th, 18th and 19th centuries, Islam acted as an ideology of change, both politically and socially. All subsequent attempts at union were by the Moslems."

"Paradoxically," states Professor Barry, "it was the colonial conquest that in a way put an end to the political fragmentation of Senegambia. When France conquered a large portion of Senegambia at the end of the 19th Century, it united all of these kingdoms. At the same time, it created imbalances."

"The colony of Senegal became a homogeneous region, but the English held onto the Gambia. Guinea-Bissau was conquered by Portugal. The rest of Senegambia, although still under French rule, was joined to other colonies. Subsequent independence merely confirmed the political map as it had been planned by the colonial powers."

"Now the independent states realize the impossibility of developing given these ridiculous boundaries," points out Boubacar Barry. "We have two enormous joint economic projects: the Gambia River Development Organization (omvg) and the Senegal River Development Organization (omvs)." The aim of both is the agro-industrial development of the two river basins. The omvg includes Senegal, Gambia, and Guinea. The omvs includes Senegal, Mauritania, Mali, and Guinea.

"These are without doubt the two largest regional projects that could ensure the social and economic development of the region, irrespective of national boundaries," says Dr Barry. "Why," he wonders, "can there not be a single structure — the first modern Senegambian structure — which brings all of the countries, including Guinea-Bissau, together to consider these problems globally?"

"It is a dream based on an historical reality," he says. "I do not think politicians have this vision yet. It is good to draw their attention to the enormous possibilities of a Greater Senegambia." □





# A TOUGH NUT TO GROW

FIBI MUNENE

**A**fter the Second World War, hungry Europe was in a hurry to win and develop new sources of food and raw materials. In Britain, for example, the shortage of cooking fat became a political issue in 1946 when homemakers protested the cut of 14 grams of fat a week. According to an official at the time: "The shortage of fat is probably the most serious and intractable part of the food position in Britain, and the authorities at the Ministry of Food can see no solution to it, in this generation at least, unless some great new source of production is developed".

That great new source was to be groundnuts (*Arachis hypogaea*), grown in East Africa. Thus the British Groundnut Scheme was launched, aimed at supplying 600 000 tonnes of oil within 5-6 years. The seed of the groundnut, a legume also known as peanut and monkey nut, contains up to 50 percent edible oil and 35 percent protein.

A mission sent to East Africa surveyed some 50 000 kilometres of Tanzania (then Tanganyika), Zambia (then Northern Rhodesia), and Kenya. After a whirlwind 10-week study, some 1.3 million hectares of virgin land in Tanzania were deemed suitable for large-scale mechanized production of groundnuts, something never before carried out in tropical Africa.

Farmed by the British Overseas Food Corporation, the lands were at Kwonga

*Groundnuts have great potential as a food and cash crop in East Africa. There are many problems to overcome, however, before that potential is realized*

in the Central Province, Urambo in the Western Province, and Nachingwea in the Southern Province. Contour cultivation and strip cropping, alternating groundnuts with grass, was practiced on units of 12 000 hectares each.

From the outset, clearing the woody vegetation and preserving the soil proved difficult. Because of soil compaction and abrasion, Kongwa was found to be unsuitable for mechanized production of groundnuts, sunflowers... even cereals. In Urambo, unpredictable dry periods and poor fertility resulted in severe soil erosion. Moreover, the varieties of groundnut planted were stricken by rosette virus, a disease that the survey had not considered a problem in the region.

Although Nachingwea was better suited to groundnut production, rosette and leaf spot disease caused serious crop losses. And when rains delayed mechanized cultivation of the crop, the weeds took over the fields.

In the early 1950s, after investments of more than US\$80 million, the British Groundnut Scheme was abandoned. Research on the crop in Tanzania also came to a halt.

Although large-scale planting of groundnuts has followed in other parts of the world, they are grown almost solely as a subsistence crop in Tanzania. Some 75 percent of Tanzania's cultivated lands are in dry, low fertility areas. Small farmers produce all important food crops — cereals such as maize, sorghum, and rice; legumes including soybeans, mixed beans, peas, and groundnuts; and cassava, sweet potato, and bananas. They use few inputs and hand tools mainly. Yields are consequently low and the production of soybean and groundnut has been declining in recent years.

The lack of high-yielding varieties adapted to Tanzania's conditions, poor cultural practices, and weak marketing incentives are largely to blame.

To help solve this problem, IDRC is supporting a project carried out by the Faculty of Agriculture, Forestry and Veterinary Science of the University of Dar-es-Salaam. Begun late in 1980, the project aims to develop high-yielding varieties of food legumes adapted to Tanzania's various agro-climatic conditions. And while groundnuts are the main crop studied, soybean and

green gram varieties are also being selected.

A collection of Bambarra groundnut (*Voandzeia subterranea*) will also be made and screened. Bambarra nuts are some of the most drought-resistant legumes, but very little research has been carried out on their improvement. In addition, agronomic experiments will be undertaken to develop a package of practices for various areas in the country.

In Mozambique, south of Tanzania, groundnut cultivation has experienced similar problems. Some 200 000 hectares — less than four percent of the country's cultivated lands — are planted to groundnut, mainly along the coast. The yields of 120 to 400 kg/ha are low compared to the 1000-1500 kg/ha obtained in other African countries.

Neglected during the colonial era because it was a subsistence crop, the groundnut has great potential in the country, both for local consumption and for export. Researchers estimate that 50 percent of Mozambique's agricultural land is suited to its production.

The most serious problem limiting yields is disease: Rosette and leaf spot are again threats, and a new disease, groundnut rust, is also causing heavy losses.

In 1975, a research program on groundnut was initiated at the Faculty of Agriculture of University Eduardo Mondlane in cooperation with scientists at the Instituto Nacional de Investigação Agrícola (INIA). A reasonable germ plasm base of different varieties was established and available cultivars were multiplied and screened for yield, resistance to diseases and pests, and protein and oil content.

This program is now continuing with IDRC support to develop better-adapted varieties and improve cultural practices. More than 200 local and exotic cultivars are being screened. Improvements to cropping systems will also be made and introduced to farmers. And as small farmers often grow groundnuts with maize, the best groundnut varieties for intercropping will be selected.

Compared to the British Groundnut Scheme, these projects are certainly modest, but they have the potential of bringing lasting improvements in groundnut production. And as the Tanzanian project leader notes: "Groundnut research in Tanzania began only recently because we inherited very little information from the Groundnut Scheme. Local people were not involved in the Scheme except as labourers. At present, Tanzanians are the executors of the groundnut improvement program. The advantages of this approach are obvious."



# WOMEN

## THE UNKNOWN QUANTITY



ANNE K. BERNARD

**W**omen, as the saying goes, hold up half the sky. They also bear significantly more than half the burden of Third World underdevelopment. Not only do they share equally with men the exploitation and dependency that results from poverty and lack of power, but they also suffer because of cultural biases that determine how they should behave. The traditionally narrow definitions of what they are suited to do restrict their participation in political and economic development.

Women's work outside the home is extensive, particularly in agriculture and the informal economy. Yet their contribution to national development remains largely invisible — reflected neither in national statistics nor in extension and training programs. Income-generating programs and wage employment schemes for women typically are organized on the basis of enhancing the family's economic condition. They do not account for the "double day" this creates for the woman whose household responsibilities remain unchanged. Even where reform, or revolution, have created greater political or economic equality, the traditional inequalities between men and women at home, in trade unions, and in the community, tend to remain the same.

Nonformal education carried out in the context of development activities could provide women with a powerful tool for redressing these sexual imbalances by bringing women together to assess critically both their problems and their capabilities, and to take action.

During the last decade, adult education programs have multiplied throughout the Third World. However, little is known about the quality or impact of these programs; about whether women participate and, if they do, who they are. The

extent to which women are involved in decision-making about the development, management, or evaluation of the programs has not been determined.

In most countries of the world, the majority of adult education researchers and policymakers are men. It is not surprising then that few research projects have dealt with women's needs and potential, and that most of the research done on adult education neglects the role of women in development. Little of the research comes to the attention of planners of adult education programs, nor is it effectively used by them.

Because so little is known and because women engaged in nonformal education seldom have the opportunity to share information and experience, the International Council for Adult Education (ICAE) in Toronto, Canada, launched a project in May 1980 to fill in some of these gaps. Funded by IDRC, the project aimed to clarify the nature of women's participation in nonformal education programs, the extent and quality of these programs, and to determine areas requiring further research and training in order to increase the contribution such education could make to women's development. In addition, it sought to encourage communication among women adult educators.

Because of the worldwide nature of the problem, the study was carried out in seven Third World regions: South Asia, Southeast Asia, the Caribbean, Latin America, Africa, the South Pacific, and the Arab States. Under the coordination of a woman adult educator in each of the regions, information — both printed and from surveys of practitioners and researchers — was collected. In most regions this was supplemented by individual visits and in some by regional



or national meetings. This was the first time that a broadly-based investigation of women in non-formal education had been attempted.

A 15-day workshop and study tour held in Udaipur, India, in November 1981, brought together 16 women from 14 Third World countries and two ICAE project coordinators.

The workshop was funded by the Swedish International Development Authority and coordinated by ICAE and Seva Mandir, a voluntary rural adult education organization. The workshop aimed to disseminate the studies' results and assist in network building by giving project coordinators the opportunity to share with others something of the process and results of their investigations. It also aimed to enable the group to build on these exchanges and formulate recommendations through discussions of their work and priorities.

One of the clearest statements emerging from both the project and workshop was that there is no simple or single answer to improving the condition of women who are poor and marginal in their societies. Development is a complex, continuous process. Within each region, and within each country, the particular history, culture, political and economic system shape both the problems women face and the solutions available to them. Nevertheless, there are common themes.

Perhaps the most fundamental criticism made of nonformal education activities throughout the regions is their failure, and the failure of development programs in general, to take women seriously into account as full participants in the development process. Rather than enhancing the integration of women, nonformal education programs too often contribute to their marginalization. They often foster the attitude that a woman's capabilities and role options are few, and that her contribution to the society outside the home is basically a supplementary one. The assumption that women are somehow the malfunctioning half of the population persists. Much of nonformal education is focused simply on helping women improve within the limited range of activities to which they are "suited" by virtue of their sex. There appears to be little commitment to increasing the influence of women as a group. Nor are women encouraged to analyze their situation and develop alternatives within a system that typically excludes them from the major decisions affecting their lives.

Programs marginalize women to the extent that they compartmentalize them as homemakers, mothers, and incidental wage earners, rather than perceiving them as multi-dimensional and multi-talented individuals. They marginalize women too, to the extent that they segregate them from the socio-economic mainstream. For example, small-scale craft programs expose women to the international economy, while at the same time confining them simply to producing the goods. By

denying them access to management and marketing skills or to sources of fair credit, such programs serve principally to increase women's dependency and vulnerability.

Programs that confine their "women's" activity to isolated, technical problems in the community, without an examination of the wider system and its implications for development, deny women the opportunity to take part in reshaping that system.

The workshop participants also felt that men must be included in women's development process. It is men's image of women, and women's image of themselves in relation to men, that constitutes a major part of the inequality between them. Programs typically fail to recognize that "women's problems", and their solutions, are not women's alone, but stem from the total community.

Many of the recommendations put forward in the regional reports and during the workshop were specific to the regions themselves. Common, however, were recommendations for more concerted, coordinated action in terms of women's programs and research on

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### *Education programs in the Third World have overlooked women's contribution to development*

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women. There is a need for all governments to formulate more precise, consistent, and integrative policies in support of women's development, and to provide the resources, training, and monitoring that will ensure the implementation of those policies. Greater continuity and coordination of research and training efforts in general are needed, particularly through more effective communication among nonformal educators, so that development programs build upon one another. Such coordination would help to ensure that women "are not left in a vacuum after a program is finished, but have somewhere next to go," as one participant put it, and that energy and commitment are not wasted through competition for resources or through duplication.

Research was considered to be an important factor in promoting women's development in all regions. But the participants were concerned that too often research is undertaken at the expense of action, and that the results of research already done are neither disseminated nor applied.

A number of suggestions were made

on areas for further research. Most of these call for the improvement of program practice and design. One recurrent recommendation was for more micro-case studies of different women's days — the range of activities performed, the skills displayed, the time needed, and social constraints faced. This information could help ensure that programs are more relevant to the actual needs of women. More research is also needed in the area of national statistics on women and their participation in education, in agriculture, and in the wage economy.

Much more imperative than recommendations for new research initiatives, however, were recommendations for a restructuring of the research process itself in order to make it more truly collaborative. Participants called for a shift in focus from one of dependency on outside expertise to one of control by the women who are the subjects of the research. Women, particularly at the community level, must be trained to initiate their own research, to write proposals, to secure funding, to manage the process, and to use and disseminate the results. Research on women, completed but lost within the files of a myriad of organizations, needs to be located, summarized, and translated into a language and form that can be used by grass roots women themselves.

Further action is planned. Several of the coordinators, for example, intend to distribute their reports throughout their regions to stimulate further activities. In Latin America and Africa the project is serving as the basis for building a women's component into existing nonformal education organizations. And although the Council will not be involved directly in these activities, the ICAE's Women's Program will continue its advocacy and networking role and the Council's General Assembly later this year will include a special Policy Working Group on women.

If the project and workshop brought out the many problems and weaknesses in current nonformal education activities for women, it was also very evident that there are strengths. Chief among these perhaps are the quality of commitment and the perception of the women who participated in the project, women who no doubt represent a much wider population of researchers and practitioners. What they need, however, is an equal commitment on the part of society as a whole. They need a recognition that development efforts that do not explicitly account for women are hypocritical, and can at best be only half successful. □

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## TOWARDS A NEW INTERDEPENDENCE OF NATIONS

LEWIS PERINBAM

North and South: towards a new interdependence of nations was the theme of the Sir William Meyer Endowment Lecture delivered by Lewis Perinbam at the University of Madras, India, in August 1981. This article is extracted from the third lecture, entitled "Interdependence in the future". The first two lectures dealt with past and present trends.

Lewis Perinbam is Vice-President of the Canadian International Development Agency.

**F**uture historians will probably describe the 20th century as the century that placed the first human being on the moon, but could not provide for human well-being on earth; that demonstrated during the Second World War that nations could devote 30-40 percent of their Gross National Product to the war effort, but were unwilling, despite their enormous productive capacity and financial power, to devote one percent of their GNP to the greatest war of all, the war against world poverty.

Fortunately, there is now widespread recognition, even in the North, of the plight of the South and the need for institutional and other major reforms. For

example, one of the most important reports of our time, *North-South: a program for survival*, recognizes that the countries of the North are as vulnerable today to the forces of change as the countries of the South. The report underlines the urgency of creating conditions for a new frame of reference based on a community of interest. As the report puts it: "Economic growth in one country depends increasingly on the performance of others. The South cannot grow adequately without the North. The North cannot prosper... unless there is greater progress in the South."

People in the developing countries are often baffled

by the apparent intransigence of the North and its unwillingness to make significant changes in the status quo. This merits answer and I shall try to offer some comments.

First, there is widespread recognition in the North that aid is necessary to improve the lot of the developing South. This is shown not only by the billions of dollars that have been channeled through bilateral and multilateral aid programs on a government-to-government basis, but also by the more than one billion dollars, most of it untied, that flows annually to the developing world through the nongovernmental agencies as a result of voluntary giving by individuals.

However, aid funds come from the taxes of our citizens and taxes are regarded as a sacrifice the world over. They have to be allocated in the face of competing claims from a variety of sources, especially for domestic needs. If aid money does not reach the poor in the developing world whose condition it is intended to alleviate, as is sometimes the case, or is misused to benefit the privileged in the developing world, or used in other questionable ways, it causes resentment.

People in the developed world also find it hard to understand why some developing countries that were self-sufficient in food 20 years ago now find it necessary to import a million tonnes of food grains annually, or why a country like Zaire that was a net food exporter 20 years ago spends \$300 million a year — one third of its total export earnings — on food imports.

Second, people in the North are disappointed by the apparent reluctance of

many developing countries to pay greater attention to basic needs in their societies. For instance, the World Bank quadrupled in real terms its lending in basic needs categories from 1970 to 1980, but it found that less than 20 percent of the benefits of these programs have gone to the absolute poor in the developing countries. In these circumstances, it is sometimes argued that if the international economic order is altered in tune with the demands of the South, such changes will only increase the hold and power of corrupt or inefficient governments and thus perpetuate poverty and inequalities.

Third, the North rejects the notion that it "owes" compensation for the exploitations of the colonial era and the profits made by private commercial interests. The feeling of the South that it has a "moral" right for redress of what it perceives to have been economic injustices in the past falls on deaf ears because this way of thinking is alien to the North.

Fourth, in expecting the South to make more rapid economic progress in the light of the aid it has received, the North has difficulty in understanding the burdens of backwardness that three centuries of colonial rule have imposed on the South. People in the North often cannot appreciate that the damage of colonial rule will take many generations to overcome and that those who have been corrupted to lead servile lives cannot become creative and productive citizens overnight. They do not always realize that the former metropolitan powers of the North have contributed, in large measure, to the under-



development of the South.

Fifth, the spectre of growing unemployment is prompting many countries of the North to turn increasingly to protectionist measures. For instance, textiles are still one of the biggest employers of industrial labour in the European Economic Community, and provide about one out of every ten jobs in the manufacturing industry. Between 1973 and 1980 about 800 000 workers in the textile and clothing industry lost their jobs, a drop in employment of about 25 percent.

These observations suggest that the barriers to understanding between the North and the South are psychological as well as economic. They are rooted in historical and cultural attitudes prevailing in the North and in the South and must be treated with understanding and generosity. What is clear is that more international meetings, confrontations, and diplomacy are unlikely, in themselves, to bring about a breakthrough in the present impasse in North-South relations. It will require fresh approaches, humility on both sides, and a new vision of the world as an interdependent whole.

One of the factors hobbling progress on North-South issues is the notion that it is primarily a matter of the South extracting concessions from the North; this forces the participants into blocs and invites confrontation. As a result, the developing countries do not often realize their own potential for action.

I wish to offer a few ideas that I hope might stimulate thought and fresh initiatives towards finding a basis for the new interdependence which is emerging.

In the past few decades we have seen interdependence being fashioned through a variety of international, regional, and political institutions. The common feature of all these associations is that they are

governmental and reflect an institutional type of relationship. The interdependence of which I wish to speak has another dimension: It is to recognize the role of the citizen in creating the interdependent community of the future. One of the ironies of history is that citizens are usually left out of the issues that involve them most. As a result they feel a sense of helplessness and neglect and become indifferent to the actions of governments.

The kind of interdependence that is now emerging is too important and too complex to be left to governments or international bureaucracies alone. They are not usually capable of being the agents of change. Change requires the active participation of all citizens.

The new international economic order is essentially a challenge to the peoples of the world, as well as to their governments, to reorganize and restructure our world in the context of the 1980s. It is also an opportunity to find innovative and even daring solutions to problems which governments and international organizations have not been able to solve.

While individuals and communities may not be able to find solutions to global problems, they can be a starting point. But more important, they can often stimulate ideas and offer new insights of the sort that seldom come from governments and bureaucrats. To this end it might be worth creating an International Commission of Citizens, drawn from the North and from the South, to add a new dimension and give fresh impetus to the efforts of governments in the search for a new international economic order. It could be a means of involving knowledgeable citizens from the North and from the South in some of the issues that have divided governments; it could also identify ways in

which the peoples of the North and the South could undertake joint endeavours in the educational, social, and cultural fields to strengthen understanding and relations between the North and the South on a human level.

Second, and as a further step, governments, especially in the South, should give greater encouragement to the vast network of nongovernmental organizations to intensify their efforts to work together in all kinds of joint ventures. They are not "do-gooders", as smug government bureaucrats often term them, but "good doers". They play a valuable practical role by undertaking the sort of development projects which governments often ignore, or are not equipped to undertake.

Third, there is the problem of massive and widespread unemployment in the South. Governments alone will not be able to create these millions of jobs that will be needed in the future. However, the private sector, and especially small- and medium-sized enterprises, can play, as indeed they are already playing, a valuable role in job creation in many developing countries.

Fourth, it may be in the interest of the developing countries to explore the potential of private foreign investment in the development process with an open mind, for two reasons. For a start, it is unlikely that the developing countries will be able to obtain all the financing they require for their development from governments and international agencies. Furthermore, it is the private sector, and not government, that possesses much of the technology, expertise, and experience that the developing countries need so desperately.

This brings me to the role of universities in the new interdependence. The traditional role of the university and its relevance in today's society are in question. Yet, at no other time in history

has the role of the university been more important. But the university must abandon the still-lingering remnants of excessive traditionalism and adherence to the status quo that characterized its past. Today's society does not tolerate the luxury of knowledge for its own sake; it also requires knowledge to be applied to the service of humankind.

The world's present condition and the problems that beset it give universities an opportunity to be instruments of change. Our world needs the universities for their ideas and imagination. They can be the heartbeat of the world's people. They can bring the benefits of science and technology to the world's toiling masses and help build the human infrastructure for modern states.

This will call for more interdisciplinary and inter-professional studies, and the cultivation of people who are capable of adapting and integrating knowledge for today's needs, and who will do so in ways that respect cultural traditions and social values. They have to prepare new generations for social responsibility in ways in which they have never dared to do. At the same time, they will be called upon increasingly to be constructive and fearless critics of governments.

If we are to rekindle the hopes of humanity for a just and stable world, we must be unflagging in our efforts. This is a matter in which both the North and the South can and must take initiatives. If the nations of the North and the South can blend their experiences and work towards limited but attainable objectives, we may be able to edge forward, no matter how slowly, toward agreements on the vexing questions of reforms in the major trade, monetary, and financial structures and institutions which at present divide the North and South. □



STUART DAVIES

# NET BENEFITS

## CAGECULTURE IN THE DOMINICAN REPUBLIC

**T**he Dominican Republic shares the Caribbean island of Hispanola with Haiti, and also shares many of the same problems. Rapid population growth, coupled with severe deterioration and loss of farmland due to erosion, has meant that people are less and less able to provide themselves with an adequate diet. The shortage of animal protein is particularly serious, especially as an outbreak of African swine fever in 1979 forced the slaughter of the entire national pig herd.

The people of the Dominican Republic rely on fish for much of their protein — the average per capita consumption is 10 kilograms. The sea fishery could not keep pace with the demand, however, and until 1979, the country annually imported about 40 000 tonnes of fish at a cost of US\$8 million. That year Hurricane David devastated the coastal fishing villages.

The Dominican Republic's extensive river system and network of reservoirs created by hydroelectric and irrigation dams have been stocked with fish since 1952. But despite their low price, freshwater fish were not well liked by consumers.

The set-back to the fishing industry in 1979, however, coupled with growing food shortages, called for the expansion of aquaculture on the island. Thus in 1980, IDRC supported the Republic's Department of Agriculture in a project to grow fish in cages anchored in the country's inland waterways. This is the first project of its type in the Caribbean.

The project sought to improve the diets and incomes of people in poorer rural communities and at the same time demonstrate the practicality of fishculture as an alternative to increasingly insecure land-based production. Under the direction of Emilio Olivo, the Centre for Investigation and Improvement of Animal Production (CIMPA) began working with the people at Tavera,





the site of a large hydroelectric reservoir in the northcentral region.

Initially, 36 small cages built of bamboo frames and nylon netting were used to determine the best cage designs, fish stocking densities, feeding programs, and types of fish. Wherever possible, local materials were used to ensure that the population would always have ready access to the resources needed to carry on in future. The 3-cubic-metre experimental cages were stocked with *Tilapia mossambica* and *Tilapia nilotica*, and researchers began gathering data. Fish stocks were obtained from CIMPA nurseries and ponds at a fishculture station in nearby Nigua.

Stocked at a density of between 25-125 fish per cage, tilapia grew to a harvestable size of 130-150 g in six months. The researchers had tried various supplemental feeds, such as coffee pulp and chicken manure to boost growth, but found that the fish grew most economically on just the natural planktons found in the reservoir. The *nilotica* were the faster growing of the tilapia species used, and had they been available in sufficient quantity as fry, would have been used exclusively. As the trials advance, the researchers hope to be able to begin breeding experiments to develop a hybrid tilapia specifically adapted to the conditions in the Dominican Republic.

With the first set of experiments in progress, similar experiments were initiated in two other areas in order to compare sites, fish yields, and the economic feasibility of cage culture. The data collected from these experiments showed that cage culture was commercially feasible. This warranted the construction of 20 commercial size cages of 100 cubic metres each, at a cost of about \$300 per cage. Now operational, each of these cages is expected to yield a few tonnes of fish annually. These cages are being monitored and modified to further improve the level of production; and in two to three years the total fish production in this area is expected to increase tenfold.

In addition to the floating cages for tilapia, researchers are investigating bottom-resting cages for growing carp. Common carp are being grown in efforts to make the best possible use of the bodies of water by using different combinations of fish. A modification, thought suitable for use in canals, is being tried. As the Dominican Republic has an extensive irrigation canal system, this type of culture could greatly increase both fish production and the number of potential beneficiaries.

Both carp and tilapia are cheap fish, and will thus be available in villages for lower income groups. In order to increase the income of this group as well as their diet, another type of culture experiment is currently underway. Two large cages are being used to produce large mouth bass, fed live tilapia harvested from sewage treatment lagoons.

The tilapia as feed are available at virtually no cost, as people will not eat the fish harvested from wastewater. Bass, on the other hand, command an extremely high price. This type of nutrient recycling may therefore be very profitable. In addition to more money for the campesino fish farmers, the experiment may yield important information that could be applied to other fish culture and wastewater treatment programs in the tropics.

Obviously, one year of experimentation is not sufficient time in which to obtain a thorough understanding of the water bodies and to determine the ideal fish stocking densities and other factors. There is a danger, however, in relegating implementation to second place behind research, particularly when a definite need exists. The delays incurred while attempting to arrive at a theoretical optimum production — which may never be realized — rather than improving existing production, can jeopardize the enthusiasm of the local population in a project. The Dominican team therefore moved quickly, with telling results.

In fact, the involvement and interest of the local people were some of the primary reasons why the project developed as rapidly as it has. At the reservoir of Tavera, for example, the people recognized the project's potential for supplementing both their diet and income. The 10 000 inhabitants, most of whom are grouped into 41 cooperatives, participated voluntarily in the experiments, and provided free labour, constructing and guarding the cages. In return, they were given the fish produced from all experimental cages. The cooperatives are now soliciting funds and materials to launch further commercial projects within various zones of the reservoir.

The project's coordinator, Luis Betances, and technicians Ruben Muñoz and Raphael Blanco, have thus proven two important points. The first is the ease with which a nontraditional production system can be integrated into existing agricultural production. The second is the rate of development that can be achieved by a group of dedicated nationals when given adequate material resources and training. Only 16 months after the project began, the first stages of research have been completed and the peasants at Tavera are waiting for the first major harvest from their semi-commercial operation.

In the course of the project, the two technicians received intensive training and later furthered their training abroad. In addition, 48 technicians from all parts of the country have been trained in aquaculture and cage culture techniques, thus creating a pool of skilled personnel for this and future aquaculture projects in the country.

The results of the Tavera project and enthusiasm of all concerned are paving the way for cage culture's establishment as a practical and profitable industry in the Dominican Republic.

In fact, the success of the project

has prompted individuals at two other sites in the country to implement cage-culture projects. This is perhaps the first step towards the beginning of a national program. □

*Stuart Davies is a marine biologist and was project advisor to the cageculture project in the Dominican Republic.*

## TERRIFIC TILAPIA

Tilapia are thought to have originated in the Near East and Africa, and have been an important source of food throughout recorded history. A 4000-year-old Egyptian tomb frieze shows a tilapia harvest and suggests that the fish may even then have been cultured in ponds.

With the possible exception of the common carp, tilapia today is the world's most widely farmed fish. There are more than 50 tilapia species. Qualities of hardiness, ease of breeding, disease resistance, rapid growth, and high quality of flesh have made two species — *Tilapia mossambica* and *Tilapia nilotica* — overwhelming favourites. All tilapia are more or less herbivores, feeding mainly on plankton and detritus. *T. mossambica* and *T. nilotica* in particular, feed and thrive in waters so charged with organic matter — such as sewage lagoons and algae-choked ponds — as to kill other fish.

Getting some fish to reproduce in captivity is one of the greatest difficulties in fishculture (see *Reports* 10(4) January 1982). Not so with tilapia. They are so prolific that overpopulation soon becomes a problem, reducing harvested size and market value if not properly managed. Cageculture, such as practiced in the Dominican Republic, appears to provide a form of population control by inhibiting nest building or breeding in the net cages.

In some species, notably *T. mossambica*, the fish can mature at 2-3 months under certain conditions, and may breed every 3-6 weeks. This is not desirable, however, as it leads to small, stunted fish.

Growth rates are rapid, but vary according to stocking density, spawning frequency, and food supply. Under very good conditions, *T. mossambica* can grow up to 850 grams in a year, but not when they breed: 85-140 is average. An annual harvest of 500 kg/hectare is normal, but fertilization and supplementary feeding can double or triple these yields.



## GETTING THE MESSAGE BY COMPUTER

BOB STANLEY

The invention of the transistor put a radio within earshot of virtually every human being on earth. Thanks to the microchip, the day may not be far off when everyone — from city apartment dweller to village farmer — has access to a computer.

Costs of computer equipment have been falling steadily for years, in defiance of inflationary trends. At the beginning of this year, for example, one major American manufacturer of "personal" computers announced a 20 percent cut in the price of its most popular model. Industry experts predict the trend will continue, and become more dramatic as chips become more powerful, producers get more efficient, and markets expand.

Price and availability do not make a technology appropriate, however. What would be the use of a computer in a remote village in the Third World? Surprisingly, for those who think of appropriate technology in terms of windmills and water pumps, there are many possibilities — from helping farmers calculate optimal cropping patterns, to serving as a teacher's aide.

The most promising use of computers in terms of community service in the developing countries, however, may well be as a means of communication. To keep a village health worker in touch with the regional health centre, for example, or to enable an agricultural extension worker to obtain on-the-spot answers to farmers' problems.

Using a combination of computer and telecommunications technology, called a computer-based conferencing system (CBCS), an extension worker could address questions to one or a dozen agricultural experts simultaneously, regardless of where they are located. All would be notified next time they "signed on" to the system that a message was waiting, and each could respond as soon as convenient.

Conferences lasting several days, weeks, or months can be and are held this way. Experts are thus able to participate in several conferences simultaneously, without ever leaving their work. And as communication costs less than travel, there is a considerable saving in money.

There are numerous names for CBCS, including computer messaging, teleconferencing, and electronic mail. They all refer to essentially the same thing: systems designed to facilitate communications among large numbers of geographically dispersed individuals and communities by using the storage, retrieval,

and processing capabilities of the computer. Users communicate by typing into and reading from computer terminals, rather than by talking and listening.

Such systems are already widely used for commercial purposes. Banks, airlines, and hotels transfer funds or reservation information across the country or around the world electronically. But many in the communications field believe such uses barely scratch the surface of the system's potential. They also believe that if global CBCS networks are developed without the participation of the Third World countries, those countries may find themselves effectively "disenfranchised" in the future — cut off from modern scientific communication.

In October last year a group of 14 specialists from eight countries, several of them representing interested international organizations, attended an IDRC-sponsored workshop on CBCS for developing nations. Their conclusion: CBCS is an appropriate tool for use in the Third World, particularly to enhance communication and cooperation among research scientists, many of whom work in relative isolation from each other.

Dr S. Ramani, of India's Tata Institute for Fundamental Research, was one of the workshop's most vocal participants. "CBCS is uncommon in the developing world, not because it is expensive or impractical, but because it is a new idea," he says. "Yet traditional means of communication . . . are very often too expensive, difficult, and unreliable."

The industrially-advanced nations, with their highly developed communications systems, look on the new medium as an area for marketing new equipment and services. "The emphasis is on creating and meeting new needs," says Dr Ramani. The developing countries on the other hand, could possibly substitute such systems for growth in traditional means of communication, such as telephones and mail.

Dr Gordon Thompson, manager of communications studies for Canada's Bell Northern Research, agrees. "If the developing countries simply duplicate the present communications infrastructure of the developed world, they will be 'missing the boat'," he says.

"The old structures simply can't do the required job. They aren't big enough, smart enough, or flexible enough. By tying themselves to conventional developed-countries' communications infrastructure architectures, the developing countries may be incurring a major opportunity cost that will haunt them within the next two decades," he declares.

But Dr Thompson warns, too, against the dangers of "prescribing" technology fixes for developing countries without careful preliminary study. "Considerable care and caution must be exercised. Very little is really known about the impacts of communications technology." And he adds bluntly: "Not every mindless installation of the latest technology will produce the desired results."

One participant well aware of the dangers of importing technology without fully understanding its implications was Liane Tarouco, a computer scientist from Brazil's Federal University of Rio Grande do Sol. Seeking a simple, low-cost, flexible way to improve communication between researchers in universities as much as 3000 km apart, she said, they set out to design and implement their own CBCS.

The easy way would have been to buy one of the existing systems, she explained, but they chose to take the "do-it-yourself" approach. The system's small group of designers included several students, but for all concerned it was very much a question of learning-by-doing. "So far as we are concerned, this is the best way for a developing country to learn a new technology," said Ms Tarouco.

Computer-based communication is still a young technology, but it is developing very rapidly. Whether or not it is an appropriate technology for the developing world is a decision those countries will have to make soon. For as Dr Ramani explains: "Communication in developing countries poses special problems. It appears unavoidable that the developing world should seek alternative futures in communications technology." □

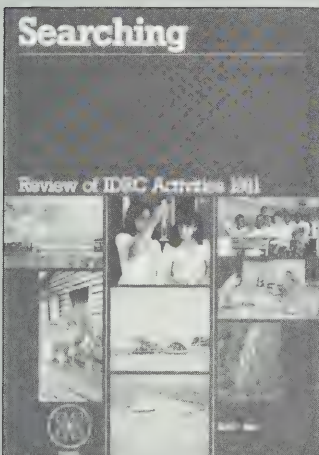
*Computer-based conferencing systems for developing countries, IDRC-190e. See listing p. 27.*



## Searching: review of IDRC activities 1981.

IDRC-192e, 40 pages.

The annual review of the Centre's activities for the past year, *Searching* provides a brief general accounting of programs: agriculture, food and nutrition; health; information; social sciences; and cooperative research. A project from each division is highlighted, and a list of publications and films is included. Also available in French and Spanish.



## Nutritional factors involved in the goitrogenic action of cassava.

F. Delange, F.B. Iteke, and A.M. Ermans, editors. IDRC-184e, 100 pages.

This study characterizes the nutritional conditions required in humans for cassava to induce endemic goitre and cretinism, and the mechanisms responsible for mental retardation. It defines the role of thyroid

failure in early life and the direct toxic effect of cyanide on the central nervous system resulting from a cassava-based diet. The findings emphasize the need for further agricultural research to develop varieties of cassava that contain minimal amounts of linamarin (a substance transformed into cyanide by enzyme activity), and techniques to detoxify cassava at the village level.

## Microeconomic evaluation procedures for Asian cropping systems research, Gordon R. Banta.

IRRI's cropping systems program is aimed at increasing food production through more productive rice-based cropping systems in South and Southeast Asia. It includes the development of research methodology, feedback on problems to the farmers, the development of technologies, and assistance to national programs. According to the author, the research teams have not been as effective as had been hoped. Economics has been identified as a weak component. Concerned with finding more efficient procedures for the microeconomic evaluation of cropping system research, this book describes IRRI's program, methodology and analytical procedures, farm management and economic

theories, and the economist's role in cropping systems research. Procedures for the analysis of data are developed and case studies presented.

## L'auto-enseignement au cours primaire : compte rendu du séminaire sur les programmes d'auto-enseignement tenu à Québec (Canada) du 12 au 15 mai 1981. IDRC-185f, 120 pages.

This publication (a translation of *Teaching yourself in primary school*, IDRC-185e) presents the results of a seminar jointly sponsored by IDRC and the Institut national de la recherche scientifique that brought together people with a range of research and development experience in the field of self-instruction in primary school. Participants attempted a state-of-the-art review of research activities and a projection of future needs in research and application of results.

## Computer-based conferencing systems for developing countries:

report of a workshop held in Ottawa, Canada, 26-30 October 1981. Compiled and edited by David Balson, Robert Drysdale, and Bob Stanley. IDRC-190e, 43 pages.

Computer-based conferencing systems appear to offer an effective tool for scientific communication across geographic, lan-

guage, and time barriers. This publication is the report of the meeting of an expert group convened by IDRC to discuss the opportunities and pitfalls such systems offer to developing countries. See article on facing page.

## Solar drying: proceedings of a workshop held in Edmonton, Alberta, 6-9 July 1981. Gordon Yaciuk, editor.

As the price of fossil fuels continues to rise, solar drying of food crops will become an increasingly important means of food preservation. Because of the diversity of crops and methods involved, IDRC and the Alberta Department of Agriculture brought together researchers from different parts of the world and of different scientific disciplines to discuss drying requirements, consumer acceptance, heat and mass transfer, and heat sources. This publication contains the papers presented and a commentary by the meeting's technical coordinator. It should interest others in developing countries with similar concerns.

To order these publications as well as other IDRC productions, please consult ad on back cover.





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# Reports

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# LETTERS

## Lethal flowers

In the "Briefs" column of your October 1981 issue (*Reports* 10(3), you refer to pyrethrum production efforts in Rwanda. I have learned from Toshio Murashige, a botanist at the University of California at Riverside (Riverside, California, U.S.A.), that simply increasing the hectareage under production is not enough: Chemical analogues will replace it unless the percentage of the flowers' poison compounds is increased.

The Ecuadorians have done it. Using conventional methods they have propagated shoots of plants, which Murashige produced through tissue culture techniques, containing 400 percent more poison compounds. Africans have ignored this inexpensive remedy.

John G. Blair  
Washington International  
Centre,  
Washington D.C., U.S.A.

## Prostitution — not so simple

The article on "Sex and the simple tourist" (*Reports* 10(4), January 1982) is kept on an unemotional and matter-of-factish note, fitting and reflecting the nature of your institution. In spite, or perhaps because

of it, the reflections it evokes can hardly be contained within the bounds of science and philosophy.

Jane Cottingham sees the solution of the problem in the achievement of independence of the poor from the rich. Is it a question of sociological prognosis or of faith? The opinion of many experts — including those of your contributors — attest in unison that we may not live to see the spanning of the abysmal gap between the rich and the paupers of this world.

The instances of blooming prostitution in the affluent societies belie the conclusions of the article. Should we be stressing the search for other, possibly more effective and not beyond-the-horizon means of upholding human dignity? Shall we try education? Moral education, perhaps?

K. Pawlikowski  
Ottawa, Canada

*Letters from readers are welcomed, and should be addressed to:  
Editors, IDRC Reports,  
P.O. Box 8500, Ottawa,  
Canada K1G 3H9*

## UPDATE

### Checking STD

Very little information is available on the incidence and prevalence of sexually transmitted diseases (STD) in developing countries (*Reports* 10(3), "The hidden epidemic"). It would appear, however, that these diseases are endemic in most countries of the Third World.

One of the most common STD is gonorrhea. The infection is so prevalent in Africa that in some areas its symptoms are regarded as normal in adolescence.

The most serious complications of gonorrhea are found in women. Pelvic inflammatory disease (PID) may occur in 20 percent of untreated women, leading to sterility, ill health, and ectopic pregnancies. Children born to infected mothers may develop serious eye infections. Unfortunately, the majority of women with PID go undiagnosed and untreated.

To assist Nigeria's policy-makers in formulating effective control programs, the Department of Obstetrics and Gynaecology of the University of Nigeria Teaching Hospital has now launched a project to determine the incidence

of gonorrhea in women attending the hospital's clinic. Supported by IDRC, the project will also evaluate the effects of treatment. Researchers will also monitor the incidence of penicillin-resistant gonorrhea, as the emergence of resistant strains of the *Neisseria gonorrhoeae* bacteria is now posing serious obstacles to the control of the disease throughout the world.



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jacques Dupont; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee.

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**Cover:** Sapallanga near Huancayo, Peru: Mother and child in a timeless pose. One part of the relationship between mother and infant, breast-feeding, is changing with the times. See stories pages 14 and 17.

**Back cover:** Nomads, such as this one in Senegal, are not so much ranchers as subsistence livestock farmers. Droughts and population pressures have meant that they are less able to live on their animals. See story page 4.

*Africa's nomadic  
pastoralists face an  
uncertain future*

# HOME ON THE RANGE

MICHELLE HIBLER

**"A**s the dry season scathes you, the wet season consoles you." So says an old Somali proverb. But there was little consolation for Somalia's population in the early 1970s as the "drought with the long tail" tightened its grip on sub-Saharan Africa — the Sahel — from the Atlantic coast to Ethiopia and Somalia.

The failure of the rains brought famine and misery to millions of people in Africa's arid lands. It also threatened the existence of age-old cultures and means of livelihood; many nomadic pastoralists set out on what was possibly their last migration.

The drought was perhaps only the most publicized threat to the existence of pastoral societies that include West Africa's Fulani, Tuareg, and Moors and East Africa's Maasai, Kamba, and Turkana. Despite their differences, the pastoral people share many common traits and many of the same problems. All face an uncertain future.

Climate has always made the pastoralist's life tenuous. But the nomadic people were able to maintain a precarious balance between themselves, their animals, and their environment. The essence of their life is movement and this life is markedly seasonal. During the rainy season, the pastoralists move their herds from pasture to pasture. The herds consist of different types of animals — goats, sheep, cattle, and sometimes, camels. Each species has a different value as food, means of transport, and as stored wealth. They make use of different types of pasture and at varying distances from the camps. They also have different levels of survival in hard times, and of increase in good times, thus increasing the odds for the survival and prosperity of their owners.

As temperatures rise at the beginning of the dry season, the Sahel's nomads retreat to the wetter southern farm lands or settle temporarily around water holes. Families will often break up, the men taking cattle to the south to graze on flood-retreat pastures along rivers or on stubble in farmers' fields, while the women and children stay behind. Some young men leave the community to seek seasonal work in towns. But they return to the northern rangelands with the rains, leaving the

fields — and the tsetse flies — to the sedentary farmers.

Traditionally, nomadic movements were not random. The time spent at each well on migration routes was regulated by tribal leaders. This is all the more important because although animals are individually owned, the grazing lands and natural water sources are considered to be public resources available to all stock owners in the community. Overgrazing was carefully avoided.

Various changes occurred in the past decades to upset this precarious balance. In West Africa, the travels of nomadic tribes became increasingly circumscribed during colonial times by the French, who restricted movement to specific territories. The establishment of independent countries then set boundaries across migration routes. Farming spread northward from the south into marginal territories, pushing the pastoralists into ever drier regions.

A similar process occurred in East Africa. In Kenya, for example, the fertile well-watered lands of the Rift Valley were opened up for freehold title during the colonial era. The Maasai, who used the lands for grazing, were given individual titles to lands previously used by all. As land values escalated, much of it was sold to outside cultivators, denying pastoral use.

While the rangelands were shrinking, human and animal populations were increasing drastically. Veterinary advances and vaccination campaigns meant fewer animal deaths. Unusually good rains in the 1950s and 1960s and newly drilled deep borehole wells provided year-round water and rich pastures. The Food and Agriculture Organization of the United Nations (FAO) estimates that between 1960 and 1971, the number of cattle in the Sahel rose from 18 to 25 million, although studies of the carrying capacity of the region consider it cannot support more than 15 million.

Social as well as economic motives prompted the herd increases. The pastoralists accumulate large numbers of animals for security. Having animals to lend to others earns the owner a high credit rating — being able to borrow from others in hard times. Animals are also a mark of prestige and a social



currency needed to create and strengthen social ties of all kinds — bride payments, for example. Animals are sold or slaughtered only when necessary to buy grain and food or other necessities, and for celebrations.

As the herds expanded, more forage was needed. Trees and grass cover were damaged, particularly around water holes where large numbers of animals congregated. The process of environmental degradation thus begun led to desertification during the drought. In the process, some 30 percent of the herds were lost.

The nomads' response to the drought was movement, but movement of a type not known before. West Africa's nomads migrated south earlier in the season than previously. Many did not return to the northern pastures. Others, particularly those who had lost their herds, came to the cities in search of work. Entire families appeared where only men had come before. International migration also occurred on a large scale. Streams of migrants poured into drought-relief camps set up in a number of countries.

Demographers and anthropologists consider that these movements may be permanent as the nomads adjust to life in the cities. They also feel that they may be an indication of future trends.

The upheaval of the 1970s drew world attention to the latest plight of Africa's pastoralists, but they have been losing ground for decades. Settlement





*Animals are everything to these Senegalese Pular pastoralists — capital, security, prestige, and social currency. Below: Maasai children learn pastoralism early, but their future may depend on more formal schooling.*



## THE SOMALI EXPERIENCE

One of the countries hardest hit by the drought of the early 1970s was Somalia, where two-thirds of the population are nomadic pastoralists. By mid-1975, some 270 000 of them had flocked to the 20 drought relief camps set up by the government.

Planners estimated that the denuded rangelands would be able to reabsorb only 128 000 of the displaced pastoralists. Deciding to turn disaster into opportunity, the Somali government launched a nomad resettlement program.

In 1975, some 115 000 nomads were resettled in three permanent agricultural communities, and 15 000 in three fishing villages. But, since the move, the population of the agricultural communities has declined steadily to slightly over one-half their original size.

The development of the communities has also been inhibited by various problems such as delays in obtaining equipment, unsuitable sites and the settlers' lack of farming experience.

Despite the importance of nomad resettlement in Somalia, no research had been carried out to evaluate, monitor, and improve the programs. In 1981, therefore, IDRC supported a project proposed by the Somali Settlement Development Agency to collect and analyze socioeconomic data on the settlers. The study should yield valuable information on the schemes and on the processes involved in the transition from nomadic pastoralism to settled agriculture.

programs, wage policies favouring migrant labour, and forced commercialization have been implemented in order to absorb them into the nonpastoral economy. Changes in traditional land tenure patterns, the expansion of agriculture, and destocking programs have reduced their share of economic and political life.

Researchers participating in a 1980 conference on the future of pastoral peoples, held in Nairobi<sup>†</sup>, point to the governments of the countries concerned as the major source of pressure and constraint on pastoral systems. Nomadic peoples, they say, have often been viewed by authorities as fundamentally opposed to the State, which has difficulty both in exercising control over them and delivering services. Most governments have also considered pastoralism to be an uneconomic and archaic way of life that should be discouraged in favour of more intense, productive means of food production.

As Walter Goldschmidt, an anthropologist from the University of California at Los Angeles, stressed during the conference, most programs aimed at "solving the pastoral problem" have failed. Attempts to improve environmental conditions by measures such as the provision of wells, have contributed to overgrazing. Attempts to control the number of animals through stock reduction schemes were resented by herders forced to sell animals and proved difficult to enforce. To encourage

the sale of animals, economic and marketing services were provided. But these met with little success, because pricing policies were more favourable to the urban consumer than to the pastoral producer.

One of the most often tried methods of transforming the nomads' attitudes to cattle and of encouraging them to settle has been the establishment of group ranches. In the 1960s, for example, 14 ranches were created for 100 Maasai families in the Kaputei area of Kenya. But existing Maasai social groups were not used for demarcating these ranches, and the Maasai were well aware that the ranches would not always be able to support year-round grazing.

Some of the new ranchers therefore arranged to have family members registered in different ranches so that the traditional practice of kinship reciprocity could be used to gain access to lands in other ranches as the need arose. They were unable, however, to stem the flow of cattle into their area. Armed clashes broke out over territorial invasion and grazing rights.

According to Goldschmidt, the ranches succeeded in disenfranchising and pauperising the majority of the population. Elites were created and the ranchers were dissociated from their own communities. He attributes the failure of these programs to poor planning, lack of coordination, and disregard for the pastoral peoples' knowledge of





*Ethiopia: the droughts of the early 1970s that parched the Sahel destroyed the balance of people, animals, and land.*

their environment and resources, and of their social organization and value systems.

Although many scientists now recognize that traditional pastoralism is profoundly rational, and is perhaps the only way to effectively use the arid rangelands, they also recognize that problems exist. Not all pastoralists driven from rangelands by drought can be returned, even if their herds could be rebuilt. Ways must also be found to bring services to these populations.

Many forces are therefore working in the direction of settlement. A number of African countries are mounting sus-

tained programs to encourage sedentarization (see box). Modern means of transportation are breaking into the isolation of pastoral peoples, bringing them into contact with other cultures and under government control. Education is making inroads as some tribes now consider that educating their children into urban occupations may be the best insurance for the future.

What is to be done? The conference participants stress the need for research in technical, economic, social, and political areas to better understand the basic mechanisms by which subsistence-oriented pastoral systems operate. They also say that all development programs need to be locally based and fully involve the pastoralists. They further recommend that sedentarization

not be forced, and that traditional landholdings be respected in law.

And as John Galaty and Dan Aronson of the Commission of Nomadic Peoples, which organized the conference, point out: "Among the central new realities of the 1980s needs to be an increase in the volume of the voices of the pastoralists themselves, as they take hold of their own futures." □

†The future of pastoral peoples: proceedings of a conference held in Nairobi, Kenya, 4-8 August 1980 was published by IDRC. The conference was sponsored by the Commission on Nomadic Peoples (c/o Department of Anthropology, McGill University, 855 Sherbrooke St. West, Montreal, Canada) in collaboration with the Institute for Development Studies of the University of Nairobi.

## AN END TO WANDERING

Settlements are rising in the forboding wilderness of the Chittagong Hill Tracts, and the *jhumiyas*, Bangladesh's nomadic people, are coming to stay.

Estimated to number about 80 000, the *jhumiyas* are in perpetual search of new forests to clear, new lands to till. But after a few months and one or two harvests, they move to other places where they start over again.

Isolated from the rest of the world, the *jhumiyas* have developed a distinct culture of their own and a language that's a mixture of Chakma, Marma, and Tripura — the languages of other tribes living in the hills of Chittagong.

Little has been done to help the *jhumiyas* overcome their poverty and backwardness. But contacts with modern civilization have wrought subtle changes in their way of life, which only makes the *jhumiyas* wary, suspicious, and even antagonistic to ways of life different to their own. This attitude has been one of the

major obstacles to the Bangladesh government's efforts to bring the *jhumiyas* into the mainstream of modern society.

But despite past failures to speed up the assimilation of the *jhumiyas*, the government is not giving up. It is now vigorously pursuing the *Jhumiyas* Rehabilitation Scheme, which seeks to end the nomadic life of the tribe.

Under the scheme, each *jhumiya* family will be given two hectares of land, and a cash grant of 14 000 taka (U.S.\$924). Each family will also receive fertilizers, seeds, and light farm tools. Hand-in-hand with the resettlement program, the Chittagong Hill Tracts (CHT) Development Board will teach them modern farming methods and provide marketing facilities for their products, as well as education and health care services.

Government workers claim they have succeeded in overcoming some social barriers, and the *jhumiyas'* attitude is slowly changing from one of suspicion to grudging acceptance.

The program has been careful to avoid offending the sensibilities of the *jhumiyas*, or to interfere unduly with their old ways of life, particularly in the tribe's religious and cultural life.

Hampered by financial problems, the CHT Development Board had to establish priorities to avoid wasting precious funds. The first task was to select acceptable settlement sites, linked by a network of roads.

The most crucial step was the selection of willing *jhumiya* families for settlement. So far, the board has settled 3 500 *jhumiya* families in 49 collective farms. It has given away about 5 million taka (U.S.\$330 000) in cash grants and 7 082 hectares of land. If the current pace of settlement continues, the entire *jhumiya* community will be settled by 1985.

Such a development, say board officials, would help increase the agricultural output of the CHT by three to four times.

*Abdul Kashem, Depthnews.*



**T**here are an estimated 12.6 million refugees in the world today, 95 percent of them in developing countries. And although analyses of future "refugee potentials" indicate that the numbers of the dispossessed are likely to increase, it appears that the international community is not yet ready to adequately respond to the growing refugee problem.

In fact, the very definition of who is a refugee is cause for disagreements. "The UN Convention of 1951 (Convention Relating to the Status of Refugees) was formulated in the specific context of postwar Europe, when millions of displaced people affected by boundary shifts and changes in government existed in a legal limbo," says Kathleen Newland, senior researcher with the Worldwatch Institute and author of *Refugees: the new international politics of displacement*. "The Convention sought to define the rights of these individuals as well as the obligations of states that found themselves host to refugees for whom return to their own countries was likely to constitute at least a prison sentence — if not a death warrant."

In 1967, a Protocol was added to the Convention, defining a refugee as: (e)very person who, owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his or her nationality and is unable or, owing to such fear, is unwilling to avail himself or herself of the protection of that country.

But as Charles B. Keely points out, "the precise definition of who does and does not qualify for the benefits and protection to be extended to refugees" is a major controversy. The interpretation of persecution and the requirement that a refugee be outside the country of nationality determines the degree of protection and aid that displaced people receive and also the longer-term efforts to right their problems, Keely notes.

Writing in a Public Issues paper of The Population Council, *Global refugee policy: the case for a development-oriented strategy*, Keely exposes the discrepancy between the legal definitions and the present-day human realities. People displaced by war or civil unrest inside their own countries, for example, do not fall within the UN definition, although they are often recognized as refugees. And, frequently, governments deny that the people who have fled their country are refugees, calling them criminals, terrorists, or simply illegal emigrants. Some people are expelled from their countries and stripped of citizenship, such as dissidents or members of

minority racial, religious, or cultural groups.

At the same time, receiving countries will grant refugee status to citizens of ideological opponents who have not even left their home countries.

According to Kathleen Newland there is another dimension to the refugee problem: "Neither the UN nor any of its member nations accord refugee status to people who flee from intolerable economic conditions, unless those conditions are a direct product of war." Yet, she says: "Already, an estimated 20 million people have left their homes to seek work in other countries. The pool of possible migrants is vast: more than 350 million people worldwide are unemployed or severely underemployed. This reservoir of deprivation and frustration carries an explosive potential that could turn millions more into political refugees."

If the definition of who is a refugee is controversial, the problem of what can be done for the millions already displaced is no less thorny.

## SEEKING REFUGE

Voluntary repatriation is, of course, the ideal solution. Refugees cease to be refugees when they return to their homelands. But first the problems that originally forced them to flee must be resolved, a difficult, but not impossible task, as the return of over 10 million Bengalis to the newly created Bangladesh in 1972 shows.

Permanent settlement in the country of first asylum is an alternative solution, although less satisfactory. For the refugees, the neighbouring country where asylum is usually first sought often offers a climate, culture, and perhaps ethnic makeup similar to their homelands. But the welcome that countries of first asylum extend to refugees depends on a complex set of considerations, says Newland, including "the compatibility of the refugees with the local population, the international community's response to the need for humanitarian assistance, the political stability of the host government, and foreign policy considerations."

The last choice is the most expensive and often the most difficult to effect: resettlement in a third country. Per-

haps the most dramatic and recent example is the movement of Indo-Chinese "boat people" from Kampuchea, Laos, and Vietnam to the United States, France, Canada, Australia, and other countries. For the refugees, the problems of adapting to an often very different climatic, cultural, economic, and linguistic environment can be difficult.

The response of the international community to the plight of refugees, Kathleen Newland contends, has been built around the concept of "international solidarity" entailing an obligation to ensure that countries of asylum do not pay too heavy a price in terms of their own stability and development. Receiving countries in most cases rely on material support — money, food, personnel, and the like — to set up and maintain refugee camps. "But the humanitarian responsibility for displaced people has not been evenly shared," she says, and the burden of support falls largely on the industrialized nations — the United States, Western European nations, Canada, Australia, and Japan. "East Europe, the Soviet Union, and the oil-producing countries (with the exception of Saudi Arabia) have contributed modestly if at all," she says.

But as no country is beyond the threats to peace posed by the displacements of large numbers of people, "no country can justifiably remain aloof from the two most pressing needs of refugees: immediate humanitarian assistance and support for a long-term resolution of their plight," she adds.

It is this longer-term solution that may prove most difficult to find, because as Charles Keely asserts, "If the new name for peace is development, refugees are a product of underdevelopment." Any long-term solution to the refugee problem must include a means of eliminating the economic and political disparities that are the root cause. Any refugee strategy, he maintains, should include a shift of resources to provide aid to indigenous people in the place of first asylum and seek ways of promoting development in the countries that produced the refugees.

"Many times in this century," Keely adds, "the international system has been challenged by refugees. The challenge continues, with different faces, in different places, with causes different from the wars in Europe that threatened the international system. It has been said that the quality of a nation can be judged by the conditions of its prisons. The quality of an international system is perhaps equally well judged by the condition of its refugees." □

Rowan Shirkie

# THE FLIGHT OF TALENT

ROBERT MYERS

## SKILLS MIGRATION IN LATIN AMERICA: GAIN OR DRAIN?

**F**or 100 years, from about 1850 to 1950, heavy immigration of both unskilled and highly skilled migrants accompanied foreign capital investments and the growth of export industries in Latin America. The underpopulated continent helped relieve European population pressures, and provided refuge for discontented or persecuted minorities. Latin America's Spanish and Western cultural roots, its empty spaces, and its relatively unexploited economic potential facilitated that

immigration, most of which came from Europe.

Immigration to Latin America continues, but at a much slower pace. Since 1950 two overriding patterns of international migration have emerged in the region. First, migration between regions has increased dramatically.

That flow has been stimulated by growing economic inequalities, by sharp differences in population densities and natural resources in contiguous countries, and by changing political circumstances. A common culture, relatively uncontrolled borders, and improved transportation and communication have encouraged the intra-regional flow. Although most intra-regional migration has been of unskilled labour, high-level migration of professionals, scientists, scholars, and senior business executives also increased in the 1970s. Venezuela, Mexico, Brazil, and

Ecuador were main receiving countries for educated migrants, especially those from Southern Cone countries.

After 1950, a second migration pattern developed: that of professionals and intellectuals moving from Latin America to industrialized nations, and particularly to the United States. This migration has been a subject of concern to many Latin American governments, and they characterize emigration as a "flight of talent" adversely affecting local development, and as an indirect subsidy by the poor to the rich.

Despite the fact that most high-level migration is visible and legal, and should therefore enter regular statistics, determining the volume of such migration is very difficult. Sorting out temporary from permanent migration creates counting problems. So does inconsistency in the definition



of what characterizes a high-level migrant. Some countries do not publish statistics.

Susana Torrado gives a very rough idea of the migration flow from Latin America to industrialized nations in a recent publication of the Centre for Migration Studies, dealing with global trends in migration: "Between 1961 and 1972, 20 300 highly skilled migrants (scientists, engineers, and doctors) emigrated from Latin America to three industrialized countries

(United States, Canada, and Great Britain). However, these figures do not fully represent the total brain drain volume from the region since they do not include semi-professional technicians who constitute a major share of the highly skilled emigrants. For example, between 1961 and 1970, approximately 61 000 Latin American professionals and technicians (in addition to scientists, engineers, and doctors, this group also includes architects, medical auxiliaries, accountants, etc.) emigrated to the United States."

Torrado provides figures but also illustrates the definitional difficulties mentioned. She omits European countries of destination other than Great Britain, nor does she include business executives. And these figures must be placed in perspective. If related, for example, to the number of university graduates produced annually in the region, the numbers do not appear so alarming overall. Circumstances differ so much by country, however, that regional reporting probably distorts more than it helps the analysis of so-called "brain drains."

When one moves beyond counting migrants to examining reasons for migration and to assessing impact, the picture becomes even fuzzier. Most analyses stress the economic determinants and outcomes of migration. Indeed, the "brain drain" is at root an economic concern.

Clearly, differential employment opportunities and pay scales among nations influence the volume and direction of migration. That is evident in the "pull" of industrialized countries and oil-producing Venezuela and Mexico during



the 1970s as main destinations for Latin American migrants. It is evident also in the seductive power of international organizations with their high salaries. However, economic explanations of migration are at best partial.

Changes in migration laws, political events, and the maintenance of open political and social climates have been underrated in the study of high-level migration in general and in analyses of Latin American migration in particular. Since the end of the 18th century, nations have set policies governing the exit and entry of migrants. Even with a policy of selective migration favouring high-level migration, a quota in the United States limits immigration. Venezuela has recently tightened its rules on entry, making it no longer a primary country of destination — at least for the time being. Chile has very carefully controlled the exit as well as entrance of migrants since 1973. These policies, set in the interests of countries, not individuals, strongly affect the ability of individuals to respond to economic incentive to migrate.

Political events can exert a dominant influence on migration, independent of economic circumstances. That influence is illustrated by the out-migration of professionals from Argentina between 1950 and 1968. Political upheavals in 1956, 1962, and 1966 were followed by a marked increase in high-level emigration from Argentina, peaking in each case approximately 18 months after the changes occurred.

Contemporary Chile provides a dramatic example of political influence on migration. Following the coup in 1973, many Chilean professionals whose political beliefs were at odds with the military had to leave, sometimes to preserve life as well as liberty, or because they were dismissed from their jobs for political reasons. Intellectuals in Uruguay and Argentina encountered similar problems.

The Latin American Social Science Council (CLACSO) administered several special programs of study or job placement, in 1974 and beyond, to aid Southern Cone intellectuals affected by change in political climates. CLACSO reported that within two years following the Chilean coup, it had received requests from 1926 individuals and had aided placement of 1230. Despite the fact that a main purpose was to enable scholars to work at home or within the region, 947 of the placements made were outside the Southern Cone. Of these, 570 were in Europe, the United States, or Canada. Migration of another approximately 900 individuals was aided by the World University Service of Canada. Many other professionals left Chile on their own or with the aid of other organizations. The total number of emigrants is not known.

The long-run effect of these politically induced migrations is not obvious. Repatriation efforts are under way. An undetermined number of temporary exiles will return home of their own

accord. Some will stay "abroad," but within the region. One long-run effect of the migrations may be to build a stronger, more integrated, Latin American scholarly community. Meanwhile, migrants will turn up in statistics as part of a "brain drain" from their home countries.

To the obviously politically induced cases of migration, one must add less obvious instances resulting from cultural or ethnic discrimination. In most Latin nations one encounters pockets of ethnic and religious minorities — oriental, black, Jewish, or Protestant. Studies of international migration have not determined the extent to which such minorities are "over-represented" in the migration flows, but there is some evidence that discrimination influences migration. To illustrate: in a survey of Peruvians studying in universities in the United States, fully 25 percent of those intending to remain abroad were Protestant or Jewish, even though the total percentage of such groups in Peru is less than five percent. In the same survey of Peruvians, there was a correlation between ethnic minority status (Chinese or Japanese origin) and the intention not to return. Similarly, Judith Laikin Elkin makes the general point in her study of the Jews of Latin American republics that the insecure position of Jewish migrants has often led to further migration. That seems to be a hidden factor in high-level migration from Argentina during the last two decades, as sons and daughters of Jewish immigrants who left Europe in the 1930s and early 1940s now move on to other locations.

When one adds political repression and socio-cultural discrimination to economic concerns, the "brain drain" balance sheet for Latin America ver-

sus the rest of the world is not so clear. In some cases, individuals have been forced to migrate or have left with the blessing of governments — a siphoning off of discontent. That is as true on the left as on the right of the political spectrum. In some cases, individuals encountering discrimination cannot find reasonable employment in a tight market at home, and decide to leave at little cost to productivity in the home country.

Counterflows of professionals and technicians from the North to Latin America, and education subsidies provided to Latins studying abroad further complicate this calculation of migratory gains and losses to the region. According to the annual census of foreign students in the United States, the number of Latin Americans in institutions of higher education has increased from 6010 in 1950 to 42 280 in 1980. Some students will not return. Most will. In cases where foreign study is sponsored by a government or by an international organization, upwards of 90 percent will return home. Their education will have been subsidized in part by the institution attended. Some non-returnees will stay abroad for political reasons.

The relatively recent phenomenon of the "brain drain" from Latin America will continue to be of concern. However, taking into account the political and cultural dimensions of migration, and considering possible "brain gains," one is left with a question: Is there more rhetoric than substance to the simple notion that a significant and hurtful Latin American exodus is occurring? We are left also with the challenge of providing better information to put in perspective analyses of both gains and drains to Latin America from international migrations. □



Facing page: Export of human scientific and technical resources can be damaging. Above: Santiago, Chile. The long-term effect of politically induced migrations is difficult to assess.



# IN THE FOOTSTEPS OF THE PIONEERS

SAMBA KONÉ

*Spontaneous migrations bring new life to a remote region of the Ivory Coast. Will problems follow?*

For some 15 years now, the southwestern region of the Ivory Coast has been the preferred destination of all internal migration. Whether they come from the central, northern, or eastern regions of the country, the migrants' objective is San Pedro, a rapidly expanding port city 460 kilometres from the capital, Abidjan.

Peoples of the central region of Bandama, in particular, have abandoned their land to the rising waters of Kossou Lake to flock to San Pedro, the Eldorado of the Ivory Coast.

It was to learn more about this phenomenon — without question the largest internal migration ever recorded in the Ivory Coast — that the National University's Institute of Tropical Geography undertook a far-reaching study in 1980, with financial support from IDRC.

After independence in 1960, the Ivory Coast channelled its development efforts into the modernization of its agriculture. Because of its favourable climate, and abundant and relatively cheap labour, agriculture in the forest zone in the southern region of the country prospered. Consequently, population and primary activities have concentrated in the south: 70 percent of the population now lives in this region, and almost all export crops and more than half of the food crops are grown there. Moreover, three-quarters of the country's businesses and jobs in the modern sectors are located in the south.

But, beginning in 1968, when the construction of a port complex and a main road opened up the southwestern region, migratory movements began to flow toward the San Pedro backcountry. In the past, this region was very sparsely populated: The average village had from 47 to 171 inhabitants, and in 1965 the total population of the region was barely 120 000. The city of San Pedro did not even exist at that time. Today, its port has made it the second economic centre of the country.

As new forest roads were opened from 1971 to 1975, the influx of migrants continued and new plantations flourished. During this period, the population density of the Bouaké district, for example, increased from one to four inhabitants per square kilometre. Although migrants made up only 37 percent of the population of the region in 1971, they had increased to 59 percent by 1975. The proportion of foreigners (from Upper Volta, Mali, Guinea, Togo, and Nigeria) also increased, from 5 to 24 percent.

The demography of the original population of the region showed an "unhealthy" structure. Only about 38 percent of the population was under 15 years of age although, nationally, this age group made up 50 percent of the population. Moreover, the rural exodus had led to an imbalance in the number of men and women: In the 15-50 age group, the women significantly outnumbered the men. A large part of the migrants are men, however, who represent an important

addition to the labour force of the region.

Despite their large numbers, the migrants appear to have integrated well in the region. This peaceful coexistence is due in part to the land ownership customs that prevail in the southern Ivory Coast. Two principles govern the relationship of the local inhabitants with the land. The first is that land is above all inalienable. This means that under no circumstances can anyone gain permanent title to land. Since land cannot be sold, there are no exchanges of money in land transactions. The local inhabitants simply grant the migrant the right to use and enjoy the land. The second principle is that all land is owned: Depending on the region, the ownership may rest with the tribe, or village, or follow family lineages.

Anyone wishing to settle on a piece of land must first apply to the representative of the community owning it. In order to conclude the agreement allowing the applicant to settle on the land, he or she must pay the receiving community a symbolic price, usually a bottle of liquor (whisky, gin, or cognac). As long as the new migrants comply with the customs and usages of the receiving region, African cultural solidarity makes integration a relatively easy process.

Mr Haohouot Asseypo, director of the Institute of Tropical Geography, emphasizes that the efforts made by the Southwest Development Authority (ARSO) to open up the southwest have helped make this region particularly accessible. "The ancient fear of the forest has been conquered," says Mr. Haohouot. "Thanks to the efforts of forestry workers who penetrate deep into the forest, this region has finally come within reach of the migrants. So much so, in fact, that every day trucks arrive bringing entire families. In two to three years the families build entire villages where none existed before. Extraordinary things are happening on this pioneer frontier. New villages, teeming with life, are sprouting like mushrooms."

Although it has not yet happened in the southwest, these spontaneous internal migrations could become the source of serious conflicts in the Ivory Coast if the region's resources become strained. The Institute of Tropical Geography has begun to investigate the causes and effects of migration in the country, and the role of organizations such as ARSO in facilitating successful settlement and development in the area. This research should enable them to better understand the migration phenomenon that has until now eluded efforts to control it, or to plan its ordered progression for the benefit of the country as a whole. □

*Samba Koné is in charge of the scientific and technical pages of the Ivory Coast daily, Fraternité-Matin.*



*A "bush taxi" carries migrants to Abidjan and other Ivory Coast cities.*



# SEEDS OF GOLD

FLORENCIO  
ZAMBRANA



(Left) Hand threshing quinoa: factors such as ease of processing are included in research. (Below) About 1500 types of quinoa were collected for evaluation, many with a long tradition of use by farmers.



**T**he small, golden seed of quinoa was part of the basic diet of the Tiahuanaco and Inca cultures that flourished on the shores of Lake Titicaca in ancient times. Today, quinoa (*Chenopodium quinoa* Willd), a food grain of the *Chenopodium* or goose foot family, is still cultivated throughout the Andes, from Colombia to the highlands of Jujuy and Salta in Argentina.

In Bolivia, the plant is widely grown by peasants inhabiting the high plains and valleys. It continues to serve its ancient function as a basic food, often replacing meat in the rural diet.

Hardy and frost-resistant, quinoa will yield harvests on poor soils and with an annual rainfall as low as 300 to 400 mm. Nutritious, it contains 14 percent protein on average, and has a good balance of the essential body-building amino acids, with especially good lysine content. In addition, quinoa contains vitamin C and the B complex of thiamine, riboflavin, and niacin. The leaves of the plant are also edible.

The need to upgrade the diet of Bolivians led to, beginning in 1960, studies of quinoa aimed at determining its nutritional value and identifying possibilities for genetic improvement. Between 1965 and 1970, intensive research was carried out at the Patacamaya Experimental Station located at 3789 metres above sea level, in the eastern region of the country near La Paz. The work focused on genetics, nutritional content, crop improvement, plant pathology, entomology, and use of the seed in animal feed.

Quinoa's use in human diets has been limited because it contains saponin, a bitter-tasting and possibly toxic substance in the seed coat. But in 1970, the efforts of researchers paid off. That year saw the development of *Sajama*, a saponin-free variety of quinoa. *Sajama* is the name of one of the most important and beautiful snowcapped mountains of the eastern range of the Andes, on whose slopes quinoa is grown. This variety is cultivated in nearly all the quinoa-growing areas in Bolivia and in other countries. In addition to being saponin-free, the *Sajama* variety yields an average of 1500 kg/hectare on a commercial scale, about four times the yield obtained with traditional varieties.

Almost all the quinoa produced in Bolivia is grown by small farmers in traditional communities. About 120 000 farm families grow quinoa in combination with potatoes, barley, faba beans, and other Andean root crops in the Altiplano or highland areas. In the salt flats of the southern provinces of Oruro and Potosi, quinoa is the only crop that can be grown — some 5000 families depend on it for their livelihood. Total production was less than 10 000 tonnes annually in recent years, with the average farm yield of just over 400 kg/ha.

Quinoa is used in a variety of foods, from soups to sweets and drinks. It can also replace a portion of wheat flour in products such as breads, noodles, and biscuits, thereby improving their nutritive value. Anxious to reduce the foreign exchange costs of imported wheat, the Bolivian government has enacted a law requiring the addition of at least five

percent quinoa flour to all commercially produced baked goods. But as present quinoa production is barely adequate to meet subsistence needs, the wheat replacement goal has not been met.

Because of the social and economic importance of quinoa in the Andean area, IDRC decided in 1977 to support research carried out by the Bolivian Institute of Agricultural Technology (IBTA). The program aims to develop new quinoa varieties adopted to different agro-ecological zones in Bolivia, to develop economic production "packages" for farmers, and to train researchers.

In the first phase of the project, the researchers collected some 1500 types of quinoa to form a germplasm bank, and evaluated them on the basis of response to 20 different factors. A number of promising lines were selected, the best of which yielded from five tonnes per acre, to almost 10 t/ha. Further evaluations allowed selection of plants combining high yields, early maturity, and resistance to common diseases. The best were then given to farmers to try.

The project is now in its second phase. The selection, multiplication and distribution of improved varieties of quinoa will continue and further plant improvement research will be undertaken. Improved agricultural practices will be developed, tested, and disseminated, and technical personnel, students, and quinoa producers will be trained. The economic impact of the new technology on quinoa producers will also be determined.

To ensure that methods of quinoa farming are thoroughly mastered, the training courses will take place at the farm level. The economics of quinoa production within existing farming systems will be emphasized.

Tradition has carried quinoa into the present, now science is helping to assure it . . . and the people who depend on it . . . a future. □

*Florencio Zambrana is an agricultural engineer and coordinator of the IBTA-IDRC Quinoa Project.*



## The gray evolution

The entire structure of world population is changing as more people are living into their 60s than ever before.

There were six countries with a "gray generation" numbering over 10 million in 1975. By 2025 there will be 19. And the world is aging faster than ever before: Total world population in 2025 is expected to have tripled from what it was in 1950, but the total population over 60 years old will increase five times. One person in seven will be over 60.

Developing countries will feel the effects most strongly. While the Third World was home to three-quarters of the world's people in 1975, only half of them were over 60. By 2025, developing countries will have three-quarters of all the world's aged.

The United Nations World Assembly on Aging, being held in Vienna, Austria, 26 July-6 August, 1982, warns that the growing imbalance between aged dependents and active workers will pose insupportable burdens on the world — unless changes are made to allow the continued productive participation of the aged in societies and economies.

## Bonds of labour

The practice of securing cheap labour with loans that bind debtors to indefinite periods of servitude at low wages is keeping as many as 2.6 million people in virtual slavery in India.

A study by the Ghandi Peace Foundation and the National Labour Institute of India reports: "A man pledges his person, or sometimes a member of his family, against an advance

of a loan. This person is required to work for the creditor until the loan is declared repaid. During this period the person loses the right to move around and forfeits the right to sell his or her labour, or the products of it, in the open market." Debts may be passed on from generation to generation, or from husband to widow — and wages are kept so low as to make repayment practically impossible.

The practice is not unique to India. Other Asian, African, and European countries have types of indentured employment. Some multinational food corporations are charged with using similar means to secure plantation workers.

The Ghandi Peace Foundation has called for education and political organization of the rural poor, land reform, implementation of a minimum wage, debt release, and financing measures to abolish bonded labour. (*Earthscan*)

## Forests fight floods

The floods that devastated China's Sichuan province last summer were in large part due to deforestation on the upper reaches of the Yangtze River, according to a report of the *China Features* news agency.

Ten million people were affected as flooding collapsed houses, blocked transportation lines, and destroyed factories.

China now considers the massive floods in Sichuan and other parts of the country as grave warnings of even worse natural calamities to follow if steps are not taken to repair environmental damage caused by deforestation. Vegetation cover in the southwestern province dropped to 13 percent

recently, following a century of depredations.

Now Chinese researchers are re-evaluating trees' contribution in conserving soil and water resources. They have found that the leaf canopy of forests can retain 10-20 percent of rainfall and direct 50-80 percent of the water underground. A 3300-hectare forest can hold as much water as a conventional 100-million cubic metre reservoir.

Among the new measures to restore forests and a measure of environmental security in the country are a national tree-planting campaign in which all people over the age of 11 are required to plant three to five trees a year, and a ban on indiscriminate cutting or any cutting around water sources. (*Earthscan*)

## Cowpeas — soups to snacks

Cowpeas. The nutritious, drought-resistant legumes that are a staple throughout Africa are finding their way into farmers' fields as far away as Thailand. And since the early 1970s IDRC has supported projects to develop high-yielding, disease- and pest-resistant varieties of cowpeas.

But cowpeas must be dehulled before they can be eaten or made into flour. Home preparation of cowpeas leaves a lot to be desired: Soaking the seeds requires large quantities of water, and hand dehulling is a long and tedious task. The soaked peas are prone to fermentation and sprouting, and cannot be milled into flour without drying beforehand.

A number of projects in Africa and Asia addressed these problems and developed methods and equipment for performing the preparation tasks

mechanically. An important part of these projects has been to develop recipes — both traditional and new — to encourage wider use of cowpeas.

Two of the research teams have published small recipe books that use cowpeas whole or milled into flour in everything from soups to deserts and snacks. *Formulations for utilization of cowpea flour* contains 19 Ghanaian recipes, some of them developed by professional chefs in Accra's large hotels and catering services. *Cowpea dishes: the new development for home use*, contains 25 traditional recipes of Thailand's northeast with their nutritional analysis, as well as instructions for sprouting cowpeas and milling into flour.

For information contact the project leaders: Mrs Florence E. Dovlo, Head, Division of Economics and Consumption, Food Research Institute, P.O. Box M20, Ministry Post Office Branch, Accra, Ghana, Africa; and Mrs Tipvanna Ngarmsak, Home Processed Legumes Project, Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand.

## Danger: development at work

In the rush toward industrial and agricultural development, developing countries are paying an increasingly unacceptable price in terms of human suffering and health due to occupational injuries.

The International Labour Organization (ILO) estimates that there are 50 million work-related accidents every year — 160 000 every day — many of which result in permanent disability. And although the accident frequency rate in industrialized countries has



leveled out, the rate of fatal accidents in developing countries has doubled and even tripled. The increase, ILO says, is largely attributable to "the negative or adverse effects of transfer of technology".

In the past, safety in the workplace may have been neglected as priority was given to economic and production goals. Workers themselves were more concerned with getting better wages or keeping jobs than they were in protecting their health. Now policymakers have become aware of the need to conserve skilled workers and reduce the financial losses caused by occupational hazards. The ILO has estimated economic losses due to accidents and occupational diseases to run as high as five percent of GNP in some countries.

In South Korea, IDRC is supporting a team of researchers from the Catholic Medical College in Seoul in an examination of the factors that cause accidents in the textiles, fabricated metal products, machinery, chemicals, and metals industries. The study will provide recommendations on preventative measures. As these five industries employ about half of all workers in the manufacturing sector in Korea, the recommendations — once implemented — could have a significant impact on occupational hazards in the country.

### **Another worm cookie, my dear?**

The lowly earthworm is finding new prominence in this environment-conscious age. Earthworm raising is becoming a big business in many countries, and in the Philippines worm growers have recently formed their own association to encourage increased production.

There are good reasons for the interest in the wriggly creatures that no less an authority than

Charles Darwin once claimed have played "so important a part in the history of the world". Earthworms are prolific, relatively easy to raise (the proper term is vermiculture), and have many uses in agriculture, aquaculture, nutrition, and even medicine.

The earthworm contains about 70 percent crude protein, plus amino acids, and makes a good substitute for fishmeal or bonemeal in animal feeds. It consumes almost any kind of organic garbage, converting it to worm castings that are rich in nitrates, phosphates, and potash, and make excellent fertilizer.

Dried and powdered, earthworms could also be used in making everyday foods such as bread, cookies, and noodles. Japan, one of the world's biggest earthworm-consuming countries, reportedly uses them in a whole range of products that includes antibiotics and aphrodisiacs.

### **Better bamboo buildings**

Like most Asian countries, Indonesia is a major producer and consumer of bamboo. It is an important raw material, widely cultivated in rural areas, and used for everything from food to furniture. But the greatest part of the 3.3 million tonnes of bamboo harvested annually in Indonesia — about 80 percent — is used for construction.

Large bamboo culms are used for house posts, smaller pieces for roof frames, and split bamboo sheets are used for walls, ceilings, and roofs. It's an inexpensive, renewable, locally produced resource. But it is also prone to attack by fungi and insects such as beetles and termites.

Bamboo lasts longer if it is treated with chemical wood preservatives. But such preservatives are expensive, and often unsuitable for rural

industry. Now the researchers at the forestry faculty of Gadjah Mada University, supported by an IDRC grant, are studying some of the traditional preserving methods used by the villagers. By finding out what works, what doesn't, and why, they hope to develop a simple, low-cost method of increasing the durability of bamboo buildings.

The researchers will also use X-ray machines to study the life cycle of bamboo-boring insects. They believe that by learning more about the enemy, they may find ways to defeat it. The project will take two years to complete.

### **Rainwater on tap**

Drinking water, whether piped or pumped, is an expensive commodity to bring to rural areas. As a result, many small rural communities in developing countries still depend on unsafe and unreliable surface water for all their needs. Water from ponds and streams is often polluted, and these sources may also dry up in the dry season.

Yet all that water originally came from the sky in the form of clean rainwater — if only it could be collected and held, people would have an inexpensive water supply on tap. In many countries people use a variety of makeshift systems to catch the rain that falls on the rooftops. In Sierra Leone, environmental researchers are looking into the question scientifically.

The researchers, from the Njala University College, are studying rainwater collection and storage techniques, and measuring the amount of rainwater available. Their aim is to be able to show how to make maximum use of this simplest of all water supply systems.

The two-year study, which is supported by a grant from IDRC, will gather rainfall information from towns and villages in

different parts of the country, and will examine traditional methods of collecting rainwater, as well as testing new ones.

### **Outwitting parasites**

An experimental technique that delivers a lethal dose of antibiotic *inside* the cell wall of the parasitic trypanosome organism that causes sleeping sickness may hold great promise for treating the disease.

Of the four existing drugs used to treat sleeping sickness, one is no longer made and another is effective only in the early stages of the disease. The remaining two are toxic: one of them has been withdrawn and the other, while still in use, kills many patients.


Scientists at Britain's National Institute for Medical Research and Leicester School of Pharmacy screened over 150 compounds in their search for one with effective anti-trypanosome activity. The antibiotic daunorubicin, currently used in cancer treatment, initially appeared potent in test tube experiments, but in trials with mice, the drug was excreted by trypanosomes before it could cause any damage.

Linking daunorubicin with two proteins — albumen and ferritin — selectively absorbed by trypanosomes from their host provided the necessary targetting effect. The linkage was designed so as to prevent the antibiotic from becoming "unstuck" and excreted before it killed the parasite.

More experiments will be needed before the conjugates are potent enough to be used as drugs. Stringent safety tests in animals are also required before testing in humans.

Daunorubicin-protein conjugates are also now being tested to see if they show activity against the trypanosomes that cause Chagas' disease. (London Press Service)



A close-up, sepia-toned photograph of a woman breastfeeding her baby. The woman is looking down at the baby with a gentle expression. The baby is positioned in front of her, with its head turned slightly to the side. The woman's hair is pulled back, and she is wearing a patterned top. The baby is wearing a light-colored garment. The background is softly blurred, showing another person's face in the distance.

**“** If all those involved in promoting and maintaining breast-feeding reach their objectives, by the end of the decade we will be saving the lives of one million children a year. **”**

James Grant, Executive  
Director, UNICEF



# A BETTER START

JACQUES DUPONT

**B**reast-feeding provides the kind of nourishment that can make the difference between life and death for infants in developing countries. Yet tragically, even as research discovers more of the benefits of breast-feeding, an increasing number of mothers in the Third World are denying them to their children. Sold on the myth of "modern" feeding with bottles and formula, many mothers are abandoning a nearly perfect food for a potentially very dangerous one.

Rich in proteins, carbohydrates, fats, acids, hormones, minerals, and vitamins, human milk is a unique food. Scientists now also recognize that the interactions between ingredients in human milk are as important as the nutrients themselves. The milk's immunological properties against allergies, bacterial, and viral attack also protect newborns during the first weeks of life.

Milk substitutes are inferior products, both nutritionally and immunologically. Bottle-feeding can produce healthy babies under the right conditions, but many factors combine in the Third World to turn nursing bottles and breast-milk substitutes into dangerous products. For artificial feeding to be safe, the bottles must be sterilized and the water used to dilute the formulas must be clean, conditions that often cannot be met by poor families in developing countries. And because of the high cost of formulas, mothers often overdilute them. In Botswana, for example, it is estimated that bottle-feeding an eight-month old baby would consume 35 percent of a domestic worker's salary. The combination of these factors results in high rates of malnutrition, gastroenteritis, and respiratory infections, multiplying infant deaths and disease.

"If all those involved in promoting

and maintaining breast-feeding reach their objectives, by the end of the decade we will be saving the lives of one million children a year," says James Grant. Grant, Executive Director of UNICEF, may well be understating the number of infant deaths attributable to the growing trend of bottle-feeding. A report presented to the Committee for Development and Cooperation of the European Parliament puts the total closer to 10 million children a year.

A series of studies commissioned by the Panamerican Health Organization (PAHO) indicate that in Latin America, the death rates of children under the age of five are, on average, two to three times higher for bottle-fed babies.

A 1981 report, *Contemporary patterns of breast-feeding*, published by the World Health Organization (WHO), states that breast-feeding is as integral

a part of the reproductive cycle as pregnancy. It represents an extension of the intrauterine life in which the foetus is fed through the placenta.

But the mother's decision to breastfeed does not only provide a transition for the baby on the nutritional level. It also has important psychological and emotional benefits. Studies have shown that newborn babies are able to recognize the odour of their mother's milk. A bonding process, begun in the first seconds of contact between mother and child, is strengthened and reinforced through breast-feeding.

Breast-milk can adequately meet all the nutritional requirements of a baby to the age of four to six months, without any liquid or solid supplementation. Although some health and other factors can have a negative effect on breast-feeding, it was shown that women with significant nutritional deficiencies produced milk of almost the same quality as well-nourished mothers. (It is nevertheless essential that mothers and pregnant women receive a healthy, well-balanced, and adequate diet.)

The WHO report also states that while breast-feeding is still prevalent in many countries, the length of time babies are completely breast-fed is decreasing and varies enormously, from less than two months in Costa Rica to 30 months in Bangladesh. At the turn of the century, it was recommended that babies be fed puréed and then solid foods around the age of one year. Today, mothers are advised to begin this type of feeding at three months.

In the U.S.A., the number of babies being breast-fed declined steadily from 1922 when 90 percent of all infants were breast-fed to a low of 15 percent in 1974. In Canada, 25 percent of mothers breast-fed their babies in 1969. But according to Dr Anthony Myers, of



*Working toward a better understanding of breast-feeding: in Mexico, researchers analyze hormone levels affecting lactation and amenorrhea.*



the Child and Family Health Unit of the Canadian Ministry of Health and Welfare, the 1970s saw a startling rediscovery of the value of breast-feeding. Today, 70 percent of mothers in Montreal and Toronto breast-feed their children. This reversal, which appears to be generalized in industrialized countries, is largely due to strong educational and promotional campaigns among mothers and health professionals.

Among the poor rural populations of Guatemala and the Philippines, two-thirds of women who breast-feed weaned their babies at six months. The reason most often given is that they do not have enough milk, or have none at all. From a physiological standpoint, this is clearly not true in most cases. The reasons for stopping breast-feeding are numerous and interdependent: reliance on substitutes is preferred, particularly as mothers are given free samples; they must work in an environment unsuited to taking nursing breaks; the mother is ill; etc.

The early substitution of formula-feeding appears to have a simpler motivation to some health workers. "The reason for the progressive decline in breast-feeding is the massive propaganda of the milk companies which is particularly effective in the poor sectors of the population," says Dr. J. Kreysler, World Health Organisation nutritionist in Botswana.

The strong decline in birth rates in industrialized countries having brought corresponding declines in their revenues, the "big four" of the infant formula industry — Nestle's, Wyatt, Mead Johnson, and Ross Abbott — have attempted, through publicity campaigns and sophisticated marketing techniques, to appropriate shares of the Third World demographic gold mine. But in 1981, the Annual Assembly of the WHO voted 118 to one — the U.S.A. being the only exception — in favour of a marketing code for breast-milk substitutes that, once incorporated into national laws, would limit publicity campaigns and restrict sales tactics.

Claiming that the code threatens the national sovereignty of nations, the companies continue to make inroads into Third World markets wherever they can. Sales offices have been set up in more than 50 countries. Manufacturing plants are located in a number of developing countries.

In India, sales of infant formulas have reached U.S.\$51 million a year although the country has the highest rate of unsupplemented breast-feeding at six months. In Ethiopia, 23 different brands of formulas are for sale. And as for any product, the more it is available, the more it will be sold.

Following the recommendations of the WHO assembly, countries should enact legislation to protect pregnant and lactating mothers from any influences that could disrupt breast-feeding. The distribution of free samples of infant formulas should also be prohibited, according to the proponents of the code.

A number of developing-country governments — including Colombia, Indonesia, Jamaica, and Thailand among others — have already launched national education programs for mothers-to-be and are establishing services to assist nursing mothers. Other countries, such as Ghana, limit imports of commercial substitutes and require a doctor's prescription for the purchase of bottles and nipples. In Sri Lanka, infant formulas cannot be obtained without a prescription. Algeria has nationalized the powdered-milk import industry, thus eliminating price wars between companies.

Other educational and restrictive efforts are continuing. In the Philippines,

for example, the Head of Pediatrics of one hospital reorganized the ward to provide a better environment for nursing mothers. Within two years, the number of women breast-feeding had increased by 85 percent and infant mortality had decreased by 40 percent.

But the benefits of breast-feeding are not only nutritional. Mothers who breast-feed their children are also spacing births. Although it is not a reliable contraceptive method, breast-feeding helps to delay considerably the return of fertility as the stimulus of sucking promotes the secretion of hormones that postpone ovulation. But the length of this postpartum amenorrhea, or lack of ovulation, varies from one population to another, for reasons that are little known.

In industrialized countries, postpartum amenorrhea lasts an average of two to six months. In the Yucatan region of Mexico, researchers have noted an average duration of 10 months in urban regions and up to two years in rural areas. The IDRC is now financing a group of researchers in this region studying the relationship between postpartum amenorrhea and breast-feeding practices. A similar project is also underway in Egypt with IDRC support (see article page 17).

Other projects seek to determine the effectiveness and viability of contraceptive methods used during lactation. In Chile, a study is underway to find alternatives to birth control pills containing estrogen, which is considered to have negative effects on both the baby and the mother's milk production. The National Centre for the Family in Santiago is testing the efficiency of natural progesterone implants and of new low dosage contraceptive pills. During the first phase of the project, no pregnancies were recorded during the six months following a birth in a group of 87 women having received a progesterone implant, and no side effects were noted in mothers or babies. It would thus seem that natural progesterone implants and breast-feeding are an effective contraceptive combination. The research is continuing.

In Indonesia, where more than 60 percent of women breast-feed their babies for 10 months, and where the pill is second only to intrauterine devices in popularity as a contraceptive method, researchers from Padjadjaran University of Bandung are studying the effects of the 50 mg combined pill, the 30 mg combined pill, and the duration of amenorrhea in women who do not use any systematic method of contraception.

These studies and many others underway in all parts of the world should assist policymakers and health officials to formulate effective programs to re-value breast-feeding.

In the words of the World Health Organization, breast-feeding is "...a key aspect of self-reliance, primary health care, and current development approaches." But getting that message across is a continuing challenge. □

## THE TOXIC BREAST

Analysis of the breast-milk of mothers in one Canadian city and vicinity has revealed the presence of pesticide residues.

The Nutritional Research Centre of Laval University in Quebec City, Canada, reports traces of PCBs (polychlorinated biphenyls) and three organochlorine insecticides — including DDT — in the milk of almost all of a sample of 154 nursing mothers in the area.

PCBs were present in 99 percent of the milk samples, and in 93 percent of them, levels exceeded the health standards set by federal health authorities in the U.S.A.

Organochlorine radicals from insecticides were found in 95 percent of the milk samples, and DDT residues in 99 percent.

Neither PCBs nor organochlorine insecticides readily break down into their components in the environment. Both compounds have a great affinity for fats, and tend to accumulate in the fatty tissues of animals and humans. No research has yet demonstrated the toxicity of these chemicals in trace amounts in breast-milk on the health of newborns, however, and the Laval scientists point out that breast-milk is still the best source of infant nutrition.

There is a need, nevertheless, to study the presence of these pollutants in breast-milk. This is particularly so in developing countries, where the use of potentially dangerous pesticides is both widespread and considerably less-controlled than in Canada (see *Reports* 10(3) October (1981)). And even though subsistence farmers may not use pesticides in some countries, the compounds are transported in the air and water, and are carried to the marketplace in food commodities and tobacco. (*Quebec Science*)



**S**tanding in the warmth of the morning sun that falls across her doorway in the village of Abbis near Alexandria, Egypt, Mrs Fawzia El-Hady is nursing her child, a practice as universal and as old as time. Even though it has been 15 months since her child was born, Mrs El-Hady believes that she remains protected

lates the reproductive cycle. It is thought that the action of the baby's frequent sucking maintains high levels of prolactin: The stimulation of the nipples, received as a neural message in the hypothalamus region of the brain, is translated into a hormonal message to act on the pituitary to maintain prolactin production and milk supply.

# A NATURAL CONTRACEPTIVE

ROWAN SHIRKIE

against another pregnancy because she is breast-feeding — and that the longer she nurses, the longer she delays the return of fertility.

She may be right. A natural mechanism triggered by breast-feeding has interrupted Mrs El-Hady's monthly cycle of ovulation and menstruation. Depending on how long and how frequently she suckles her child, this infertility — called lactational amenorrhea — could last as long as two years. This traditional method of spacing births, vital to the well-being of both mother and child, offers protection against pregnancy to more women than all other methods of contraception combined, according to family planning researchers. But with growing trends away from breast-feeding (see article, page 15) the traditional practice is losing its impact on fertility.

In Egypt, not many rural women use modern contraceptives. A three percent growth rate in a population of 43 million is taxing resources to their limit, and the contraceptive effect of breast-feeding could still play a very important part in programs attempting to slow population growth here.

Lactational amenorrhea is little understood. But as researchers continue to search for effective methods of family planning suited particularly to the needs and circumstances of rural people in developing countries, they are giving it much more attention.

They know that the effect is only temporary, and varies from woman to woman. Although Mrs El-Hady has been amenorrheic for 15 months, other women experience much shorter periods of amenorrhea, and some none at all.

The secretion of milk is promoted by a hormone called prolactin that the anterior pituitary gland produces in large quantities during pregnancy. Prolactin may also suppress the delicate hormonal feedback system that regu-

lates the frequency and duration of breast-feeding then, seem to determine the length of amenorrhea, although the mother's nutrition and any other type of contraception used may also play a role.

Dr Olfat Darwish, professor of nutrition at the University of Alexandria's High Institute of Public Health, set out in 1980 with an IDRC grant to investigate how the patterns of breast-feeding and nutrition of urban and rural women in Egypt influenced the length of this natural period of infertility.

Each month for two years, Dr Darwish and her research team have visited 260 rural mothers and 290 urban ones to gather data on diet, breast-feeding practices, state of amenorrhea, and use of contraception.

The differences between rural and urban women emerged fairly quickly. Urban mothers more often combined bottle- and breast-feeding right from birth. They also switched from full to partial breast-feeding and started supplementing the baby's diet with other food earlier than rural women like Mrs El-Hady, who breast-fed for a longer period before supplementing. Rural women also tended to feed more "on demand," whenever the infant wanted. The duration of amenorrhea was shorter for urban women, pregnancy rates higher, and the interval between pregnancies shorter.

Thus, the length of the breast-feeding period was found to affect the duration of amenorrhea. Early weaning (and the end of sucking stimuli) brought an earlier return of ovulation and menstruation, and thus of fertility. Supplementing breast-milk with other food also results in a shorter period of amenorrhea than full breast-feeding.

"The mothers who breast-fed more fully or longer were able to postpone their pregnancy," notes Dr Darwish. "The others, the mixed feeders, got pregnant early, and often in spite of

their use of contraceptives, because they used the contraceptives irregularly."

The nutritional status of the mothers did not appear to affect the length of the period of amenorrhea: All of the women studied by Dr Darwish were mildly malnourished.

It is in redefining the relationship between lactational amenorrhea and modern contraceptive practice that Dr Darwish sees the application of her work. Family planning workers in developing countries put much emphasis on promoting contraception to women immediately following a birth: This is the time when women have the best access to contraceptive services and are most highly motivated to postpone another pregnancy.

At the same time, breast-feeding is being increasingly promoted for its nutritional, immunological and psychological benefits. Yet there is growing concern that hormonal contraceptives — while becoming the most widespread and effective method of fertility regulation — may adversely affect the quantity and quality of breast-milk and affect the health of the nursing infant in other ways. Ideally, women should have the option of not having to use hormonal contraceptives while they breast-feed, but still be protected against another pregnancy. (IUDs are not an efficient solution for the short period of protection required and, like condoms or other barrier methods, are unacceptable or unavailable to many couples.)

"I would like to see all mothers stick to breast-feeding as long as they can, and then after breast-feeding use contraceptives when it is convenient or indicated," says Dr Darwish. But it is unrealistic to expect that lactational amenorrhea can be manipulated to provide reliable contraception for the millions of women of different cultures and environments who need it, she points out. There are too many variables affecting the duration of amenorrhea, from individual genetic makeup to changing patterns of infant care in urban and rural societies.

Nevertheless, an understanding of how the mechanism operates and what its limitations are will enable family planners to offer women an additional contraceptive choice. "The method can be useful in rural areas, especially when the mother can lactate for a longer period of time. But it needs lots of effort to promote it. Because really, rural women don't know about how to prolong the state, about the relationship between breast-feeding and amenorrhea. If we can educate mothers to maintain breast-feeding for longer times, we can help them postpone the use of contraception." And after, when women do decide to seek contraception, both the time and the method will be appropriate — conditions that must be met if family planning is to have any success, Dr Darwish adds. □



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*A development  
science writing workshop  
in East Africa*

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# A NEW VOICE FOR SCIENCE

BOB HUGGAN

**N**ineteen journalists from nine eastern and southern African countries left their regular reporting beats on newspapers and radio stations for 10 days in February to wrestle with the practical problems of communicating science to a mass audience. They took part in the second of a series of international workshops to learn new techniques or adapt old ones to improve media coverage of science and technology for development in the region.

Organized by the School of Journalism at the University of Nairobi, Kenya, and sponsored by IDRC, the workshop was also attended by 20-30 graduate students from the School of Journalism.

The Nairobi workshop followed a similar event organized by the Centre d'étude des sciences et techniques de l'information (CESTI) at the University of Dakar, Senegal, last April (see *Reports* 10(3)). The Dakar workshop resulted in the formation of an association of science journalists determined to exchange ideas and articles and to create an awareness among other journalists in the region of the need to promote science communication in the popular media.

As in Dakar, morning lectures or presentations on development science projects or issues by scientists in the Nairobi workshop were followed by press conference-style questioning by the journalists. Four field visits to project sites also took place. The resulting articles were edited and critiqued by professional science writers and instructors acting as resource persons and returned to the students the next day. This meant the students could incorporate suggestions into the subsequent interview sessions and articles.

A 10-day workshop does not turn a journalist into a science writer. But it does begin the process of creating one. One of the resource persons, science editor for *The Globe and Mail* newspaper (Toronto, Canada), Terry Christian, commented after the Nairobi workshop: "While these journalists cannot be called seasoned science writers, the workshop gave them an introduction into the kinds of science stories that are pertinent to the people of Africa, how these stories can be developed and written, what kinds of questions to ask scientists, and how to build a working relationship with them."

"It also taught them how to be skeptical of so-called miracle breakthroughs that supposedly will solve all of the problems facing Africans. They now know that advancement is sometimes slow, painfully slow, but that a greater awareness on the part of the people can accelerate change, especially by overcoming social factors which may slow or halt development."

The participants also took away with them the knowledge — acquired with a great deal of effort — of how to

approach the task involved in the popularization of science through the media in their own countries.

The learning experience was also not confined to the workshop program. Most evenings the journalists gathered to exchange views and information on development science writing and on their countries' media in general. As most of them had not travelled extensively outside their own nations, these informal sessions were very valuable for their professional development.

Conscious that this kind of communication must not end with the workshop, the journalists, following the example of their francophone counterparts in West Africa, formed the Eastern and Southern Africa Science Writers Association (ESASWA). Its main objectives are to maintain stronger contacts between the member countries, to exchange ideas and articles on development science, and to create awareness among other journalists in the region of the need to improve science writing.

A three-member interim administration committee was chosen to run the association and will submit a progress report every three months. Elected as President was Epajjar Ojulu of the *Uganda Times*; as Secretary, Francis Harawa of the *Malawi News*; and as Treasurer, Margaret Khonje of the *Daily News*, Tanzania.

The association will first set up a system to facilitate the exchange of articles, and produce a quarterly newsletter. IDRC will provide funds to cover the newsletter's costs.

A third IDRC-sponsored development science writing workshop will take place later in 1982 in the Philippines for Southeast Asian journalists. The workshop will be held at Silliman University, Dumaguete City, 22 November-1 December, and will be organized by the University and the Manila-based Press Foundation of Asia, which publishes the *Depthnews* science news features service.

The need for these workshops was summed up by Terry Christian: "Scientific development for the Third World is only as effective as its dissemination to the people in need of it. Therefore, the need for journalists ready, willing, and able to write on development science is immense." □

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*The articles that accompany this report have not been heavily edited or rewritten. They appear basically as they were written by the participants — young journalists just starting out on the road to becoming interpreters for their readers and listeners and viewers of how science and technology is being used in the development of their countries and regions.*

*The names and addresses of the participants can be obtained from Fibi Munene, Regional Liaison Officer, Communications Division, IDRC, P.O. Box 62084, Nairobi, Kenya.*





# SALTS OF THE EARTH

PAT MATHIOT

**L**ake Magadi lies in the Rift Valley, about 120 kilometres southwest of Nairobi. The surrounding countryside is practically desert. One wonders how even the scraggly bushes and trees scattered here and there can survive in the intense heat. Little rain falls here.

What is even more surprising is that such an area should support animal and human life. Weaver birds' nests cover the lower branches of the trees, baboons jump up and down by the roadside. The adaptability of plants, animals — and people — to extreme conditions is indeed extraordinary.

It is the adaptability of people, especially, that comes most to mind as one reaches the giant soda and salt works by Lake Magadi. In the middle of a barren countryside, workers use modern machinery to tap the valuable minerals that Lake Magadi contains.

The lake has a deep crystalline bed of what geologists call trona — a complex mixture of sodium salts. The trona deposit is up to 30 metres thick, and the surface of the lake covers about 80 square kilometres.

The Magadi plant, owned by the British chemical company, Imperial Chemical Industries Ltd., processes the trona into salt and soda ash, used to make glass.

The process for salt-making is fairly simple. The trona, dissolved in water, is pumped from the lake into large salt ponds of which there are 17 altogether. The water quickly evaporates, leaving behind a layer of pink-ish impure salt.

The impure salt is removed from the ponds and wetted by a sprinkler system so that it changes from a mass of individual particles into one solid block. This idea is to prevent the salt from dissolving quickly and being washed away by those rains that do fall.

The salt is then purified (the waste being used as a component of cattle feed) and packed into 80-kg sacks. The Magadi plant produces around 40 000 tonnes of salt every year — enough to meet Kenya's demands for industrial and edible salt.

But the main product of the Magadi plant is soda ash. For this, trona from the lake bed is first pumped to a washery, where impurities are removed. After being dried in a centrifuge, the raw material is then subjected to very high temperatures (150 °C) in what the engineers at the plant call a calciner. The end product is soda ash. Annual production is 200 000 tonnes.

Magadi Soda Company, over 70 years old, has plans for further expansion. As well as talk of increased production, a new process to produce soda ash of

*Lake Magadi, Kenya: resources and technology combine to produce soda ash, salt, and a measure of prosperity in the region.*

much higher purity is planned.

There is no chance of the trona supplies in the lake ever being exhausted since the deposit constantly renews itself. Subterranean streams of the hot water dissolve sodium salts from layers of rock under the ground and the salt solution comes to the surface in the form of hot springs which flow into the lake. The heat of the sun evaporates the water from the solution, and more trona is built up.

For the 600 employees of the company, life around Lake Magadi is made possible by a 40 km pipeline which brings in fresh water from the Ngong hills.

The Maasai community in the area has benefited, too. They have access to the kindergartens, schools, and a fully equipped hospital.

In fact, just as the company's workers have adapted themselves to the heat and isolation of Lake Magadi, the Maasai too seem to have adapted themselves to the salt and soda works. Magadi is a unique blend of the old and the new, the natural and the artificial.

*Pat Mathiot is Assistant Editor, News Department, Radio Seychelles, Mahe, Seychelles.*



# FROM WASTES TO ENERGY

FRANCIS HARAWA

**D**ung. A lot of it. That's what they are trying to use for cooking and lighting homes at Nderu, a rural village near Nairobi.

The biogas project was originally set up as a demonstration unit for the United Nations Conference on New and Renewable Sources of Energy, which was held in Nairobi in August last year. Now attempts are being made to build a community biogas plant which will supply methane for lighting homes and for cooking, although at

first many villagers did not believe that their waste could do so. The project (which will cost about 200 000 Kenyan shillings [\$Cdn 27 000]) is being financed by the United Nations' Habitat organization and Kenya's Ministry of Energy.

According to H.S. Hanuman, a United Nations expert on biogas from India, the project uses animal waste from pigs, cows, and chickens. Before the plant was set up, a survey was done to establish how many cows, pigs, and

goats were available in the area, and to determine how much the villagers were spending on buying charcoal and wood. There are now plans to increase the pig, cow, and chicken population in the area.

The villagers have already built four tanks for digesting the animal waste, each capable of producing 35 cubic metres of gas per day. An average family is expected to use about 10 cubic metres per day. A pipeline is being built to take gas to the 30 homes

## HOT SAVINGS ON STOVES

EPAJJAR OJULU

**"O**ne kilogram of waste paper can bring two litres of water to boiling point in five minutes and maintain boiling for 40 minutes. One kilogram of wood can bring four litres of water to boiling point in 12 minutes and maintain vigorous boiling for five hours."

To the average person this kind of information may seem almost mythical. But to Kinyanjui Miringu, a researcher in the Nairobi University's Department of Architecture, Design and Development, there is no myth about it. It simply states the efficiency of his new cooking device that brings

economy, efficiency, and convenience to the average family and is fast becoming a great success among the cross section of Kenyans who have had access to it.

According to Kinyanjui, the idea of a new-style *jiko* (cooking stove) first came to mind when the city of Nairobi was faced with a series of electricity black-outs.

Kinyanjui thinks that one solution to the increasing shortage of fuelwood lies in improving the efficiency of the cooking devices available.

He claims that the superior performance of this new stove is due to its ability to exploit all the energy available in wood, charcoal, and biomass. Firstly, the Kimathi Jiko (as it has been trademarked) "minimizes misuse of the fuel through misdirection." Because of its shape, the jiko's heat is controlled and directed only to the desired location, immediately under the cooking vessel. The jiko also avoids wasting the smoke from the fire — this smoke consists of highly useful gases which are not usually burned, therefore resulting in an additional energy loss. In this new jiko, the smoke is reprocessed and burned to produce further heat. This is particularly important where the fuel is animal waste, which emits a lot of gas in the form of smoke.

Another important feature of the Kimathi Jiko is that burning conditions can be controlled so efficiently that the wood, while creating enough heat for

cooking, can, if necessary, be turned into charcoal for future cooking purposes.

The main design features contributing to increased efficiency, according to Kinyanjui, are:

- The twin control of the entrance and exit of the air required for combustion. This also enables precise regulation of the intensity of the fire while cooking, thus avoiding the energy waste often experienced in open-fire or open-stove systems — particularly when cooking is finished.

- The Kimathi Jiko is completely enclosed, thus enabling retention of heat for a longer time around the cooking pot, and also facilitating baking and broiling. It also has a hot water jacket which makes use of the fire's heat to warm water that can be drawn off for other uses. The water jacket also prevents heat loss via the metal sides of the stove and allows the stove to be handled easily even while burning.

- The jiko also allows for greater combustion of the gases from the wood and charcoal fuel, for greater fuel efficiency.

Kinyanjui says laboratory tests carried out at the Kiambu Institute of Science and Technology in Kenya have shown his jiko uses about 35 percent less fuel than the traditional metal stove now in use in Kenya.

Another boon for users is that the cost is not high, mainly because the materials used are obtained locally from scrap metal. If mass production of the stoves occurs, Kinyanjui forecasts a unit price of around 200 Kenyan shillings (\$Cdn 27).

*Epajjar Ojulu is Editor-in-Chief, Uganda Times, Kampala, Uganda.*





in the village: 26 have been connected so far. Only six homes are now actually using the gas, as leakages in one of the tanks delayed the project. Construction of extra tanks is expected to be completed soon, adding the needed capacity to serve all the households.

It takes 40 days for the dung, which is mixed with water at a ratio of 4:5, to start producing gas. The dung is first mixed with water into a slurry and passed into an unheated tank, which has to be kept at a temperature of between 30–35°C to achieve optimum operation. The heat is achieved by building most of the tank underground and painting the gas-containing upper portion black so that it absorbs the sun's heat. A type of bacteria which operate without oxygen then turns the slurry into methane.

At the moment, the people of Nderu are not paying for the gas, but it is estimated that once the project is handed over to the community, they will pay about 150 shillings a month. This will result in some savings, as many families presently pay more than this for their monthly energy requirements — mainly fuelwood and charcoal. Once the project is handed over to the community, each member of the community will be expected to provide the dung for the biogas plant from their livestock. They will also be required to keep a log of how much waste they have supplied, so that at the end of the month, they can be allocated an appropriate amount of the dry manure which is the by-product of the digesters.

Mr Hanuman says that the manure from the biogas digesters is a more effective fertilizer than manure obtained from a compost pit since it contains twice the amount of nitrogen. The manure is in the form of humus which is capable of retaining humidity during dry spells. The other advantage of manure from the biogas digester is that it contains no weed seeds. These are all digested in the process.

The idea of turning waste into energy is not new in the developing world. Seven million digesters are said to be in use in China, almost all of them in one province, and are used primarily for producing fertilizer. In India, the main object is energy production from cow dung, which is also commonly burned as a fuel in rural areas.

Many problems remain to be overcome in the campaign to convince villagers to produce their own methane gas. The majority of villagers in Africa, for instance, have strong cultural objections to using human waste from their pit latrines to generate the energy which they then use to cook their food and light their homes. However, in the near future, it might not be a matter of choice or taste. As reserves of fossil fuels run out, the price of oil and other sources of energy are rising well beyond the means of the average farm family.

*Francis Harawa is Editor of the Malawi News, Blantyre, Malawi.*

# NO HEALTH FOR ALL

ARTHUR SIMUCHOBA

**T**he World Health Organization's (who) target of "good health for all" by the year 2000 has been described as unrealistic by a Kenyan doctor, Dan Kaseje.

Speaking at a science-writer's workshop at the University of Nairobi's School of Journalism in February, Dr Kaseje said that although it was better to have a target than not, the size and extent of the health problem in the world was too great to be eradicated by the year 2000.

Dr Kaseje, who works with the Department of Community Health at Kenyatta National Hospital, said that the methods being used in many developing countries to achieve this target are usually inappropriate. For health services to cover everybody in the world, he said, they must be available and acceptable to the local populace. They must also be affordable, accessible, and attractive.

At the moment health coverage in developing countries is poor, Dr Kaseje said. He gave the example of Kenya where, he said, only about 15 percent of the large rural population has access to medical care.

Mortality rates in Kenya, especially among mothers and their infants in the 1–5-year age group, are still very high. Out of every 2000 children born in Kenya, 200 die by the age of two, he said. The rates are lower in more developed urban centres.

The medical service systems in many African countries, he said, are in most cases still the same as when they were inherited from the colonial rulers, and are "inappropriate for the present reality". He said that in most cases African governments tended to strengthen these same inherited systems rather than change them.

Dr. Kaseje emphasized that if health for all was to be realized in these countries, the medical service delivery system had to be different from the hospital-based "western-colonial" model. What is required in these countries was a system with a bias towards rural health, he said.

Unfortunately, according to Dr. Kaseje, there was little commitment to this in many African countries. "All that has happened in rural health is talk," he said. As a result, the inappropriate inherited system proliferates, with most of the budget being spent on either building new, or maintaining old, centralized hospitals.

Dr Kaseje doubted whether ministries of health really existed in many African countries. Referring to



Kenya he said, "We do not have a ministry of health, but rather a ministry of disease. We wait for people to fall sick and then rush an ambulance to collect them."

However, Kenya had tried to correct the situation, he noted. In 1970, the central government took over the running of rural health centres from municipalities and district councils. This was after it was established that 90 percent of the country's population lived in the rural areas.

The country was divided into rural health units in 1973. These units were meant to enhance services to the rural people. Rural health centres are the headquarters for a number of dispensaries while schools are also used as service points for mobile units.

There are six rural health training centres, one in each province, where health workers are being retrained to give them the orientation necessary for working in rural areas. There are also three rural health demonstration centres in each district where the retrained staff are posted before being finally assigned to a rural clinic, Dr Kaseje said.

At the moment Kenya is concentrating on mother care and family planning, he said. But, unfortunately, about 80 percent of Kenya's health services are still in the urban areas, leaving only about 20 percent for the rural areas where 90 percent of the people live.

Dr Kaseje suggested that Kenya should take seriously the option represented by community-based primary health care, as outlined by the WHO in 1978 at a conference in Alma Ata, USSR.

The one problem with this program, however, is affordability. The fact that it is community-based should not mean that the government should surrender its financial responsibilities to the community, because rural communities will not be able to afford it, he concluded.

*Arthur Simuchoba is Features Editor of the Times of Zambia, Lusaka, Zambia.*

## SCIENCE WRITING: BEYOND WORDS

PAUL ICAMINA

In a collection of problems that Zen teachers use in guiding students toward spiritual release, a story is told about enlightenment. A monk asks the master Ummon: "What is Buddha?". "Dried dung", answers the master.

In a way, science and technology in Asia are "dried dung".

Many families in Indian villages, for example, own one or two animals. The dried dung from these animals is used as fuel. Unscientific though it may seem, cow dung is a crucial element of village energy supplies, far removed from nuclear power plants and oil pipelines.

In Asia, as elsewhere in the world, science and technology are such an integral part of everyday life that they are taken almost for granted. The farmers, for example, plant high-yielding rice varieties in fields ploughed with rented tractors. The fertilizers used, the pesticides selected, and the irrigation systems that will water the fields are all products of science and technology, whether the farmers know it or not.

Unfortunately, there is another side to the picture. The farmers don't usually know that fertilizers, if used excessively, can pollute streams; that pesticides can be poisonous to people and animals; and that water buffaloes can be as suitable as tractors and less costly. Moreover, in some Philippine provinces, farmers are exposed to parasitic snail fever while wading in contaminated fields. Others may lose their harvest to rats and other predators. Or the farmers may be landless.

What has land reform to do with science and technology? Analysis of the world hunger problem identifies two needs: more food in developing countries and its equitable distribution. A survey by the World Bank and the International Labour Organization carried out in India, Malaysia, Pakistan, and the Philippines, shows that a transition in each of these countries to small, uniform family farms would increase national agricultural production by as much as 19 percent in India to 49 percent in Pakistan.

Concentration of land ownership has also contributed to environmental degradation. In the humid tropics, landless farmers move into rain forests, destroying valuable timber and unique ecosystems in futile attempts to farm unfamiliar soils. Insecure tenancy also threatens long-term agricultural productivity by reducing personal incentives to conserve the soil. As farmers move from plot to plot, they see no reason to protect the quality of the soil they till.

The introduction of modern rice technology, although it has increased rice yields, also entails a higher capital investment for fertilizers, pesticides, and irrigation. "One adverse effect of modern rice farming", says Dr Yujiro Hayami, a Japanese agronomist, "is the increase of dependence on outside resources for farming." In a 1974-76 study, Dr Hayami found that 16 percent of a village's annual income of some U.S. \$138 000 is paid out for fertilizers, chemicals,



and fuel. More than half of farmers' income goes for goods bought outside the village.

This is science and technology in Asia, far from the "pure" science of molecular biology or from the "sophisticated" technology of breeder reactors.

In this context, where does the popularization of science and technology fit in? As Mack Laing, founding editor of Depthnews Science Service put it: "Science is now so bound up with our lives that a newspaper that ignores it cannot claim to be informing its readership." Thus, from its inception in October 1976, Depthnews Science has sought to reflect the many faces of science and technology in a region that has retained many of its traditions while embracing the modern world.

The favourable reception given science and technology stories in Asian newspapers is due partly to the fact that Asian nations are waking to the need for more public appreciation of how science and technology can help national development efforts. Leaders in these countries argue that popularizing science helps people to understand and encourages them to cooperate in government actions on large-scale problems like conservation, pollution control, etc. Governments also argue that interesting the youth in science can lead to increases in the country's science personnel.

The developing world is now also realizing that public involvement in science and technology is needed to reach and maintain a healthy level of national development.

The key to increasing public awareness and understanding of science is the mass media. But in order to reach people, science stories must be presented in the vernacular. And as Professor P.P.G.L. Siriwardene, vice-chancellor of the University of Sri Lanka, notes, science popularization must be carried out "not in a haphazard manner, but as an important national venture." I also believe that science and technology stories can be effectively disseminated only if they are interesting and deal with the very stuff of human existence and survival.

Science writing in developing countries should not be confined to science *per se*. It goes beyond mere statistics on malnutrition, for example, and beyond the question of why the body needs food. An article dealing only with the physical aspects of malnutrition would be incomplete because it would ignore crucial aspects of the hunger problem.

A survey carried out by the Philippine Ministry of Health, for example, reveals that 85 percent of school-children suffer from protein-calorie malnutrition, "very closely linked to the available food supply." On further examination, one will find that since 1960, farms devoted to food crops have shrunk while commercial crop lands have expanded. About 55 percent of total cultivated lands are devoted to export crops, much of them directly controlled by foreign interests.

India and the Philippines, early targets of the Green Revolution technology, are countries where food grain production increased dra-

matically. Yet, the World Bank reports that per capita consumption of food grains in India in 1975-77 had fallen below the level of 1970-72, and even below that of 1960-62. In the Philippines, rice production has doubled in the past decade, but the population's average consumption of grain has fallen to the lowest level in all of Asia, with war-ravaged Kampuchea the only exception.

The mechanics of science and technology in Asia are such that ordinary citizens feel helpless, if they are at all aware of the issues. So pervasive are science and technology (as is the ignorance about them) that one questions whether citizens are sufficiently informed to have a major voice in technical decisions that may have far-reaching consequences — the establishment of nuclear power plants, drug testing programs, and the construction of large hydroelectric dams, to give just a few examples.

A problem that plagues many developing countries is that of full access to information, however. The sale and promotion of dangerous drugs is one example. In the Dominican Republic, a painkiller called Novaldin is widely advertised using the picture of a child smiling because of the "agreeable flavour" of the drug. But Novaldin is the brand name of dipyrone, known to cause a fatal blood disease. The American Medical Association in fact warns that it should be used only as a last resort, a caution not voiced in the publicity materials distributed by the manufacturers.

Faced with such a

situation, can science writers afford to be biased? Yes, in order to increase public awareness and disseminate information that is not often available to the public. I believe that science writers should be biased or, more accurately, responsive, toward what is beneficial and needed by people — provided, of course, that the facts support their view. Otherwise, the only information available to populations will be that which doesn't threaten the "status quo".

In the case of drugs, one must know that industrialized countries account for 90 percent of world output, and that in developing countries more than 30 percent of drugs may be imported. There is concern in these countries that the drug industry has been reducing its investments in research to develop more effective drugs to meet priority health needs such as the control of parasitic diseases. At the same time, herbal medicines, long used in most developing countries, have not been popularized because to do so would threaten the economic dominance of the multinational drug firms and their local partners.

Thus, science and technology cannot be separated from politics: Nor can science writing, if people are to have full access to information. To ignore science's social and political dimensions would reduce science and technology popularization to a superficial level. □

*Paul Icamina is editor of Depthnews Science Service, published by the Press Foundation of Asia in Manila, Philippines.*

# TAMING WILDLIFE DISEASES

FIBI MUNENE



*Can livestock and wildlife coexist on Africa's grazing lands?*

A range war has been waged over Kenya's plains for decades. On one side are cattle ranchers and their herds; on the other, conservationists and wild animals. At stake is the future productivity of grazing lands.

The competition is due not only to lack of space, but to the widespread belief that wild animals harbour a number of serious diseases. These diseases are transmitted to the domestic herds with which wildlife comes into contact, causing severe economic losses.

Even back in 1857, David Livingston advocated the destruction of game in East Africa as a means of eliminating the tsetse fly, carrier of trypanosomiasis and bane of animal and human. The ineffectiveness of this solution was amply demonstrated as the tenacious tsetse found new hosts, but not until thousands of wild animals had been needlessly slaughtered. Attempts to control rinderpest — a highly infectious viral disease that causes inflammation of mucous membranes — followed the same technique: Between 1941 and 1951, some 10 000 animals were killed along the Tanzania-Zimbabwe border.

Since then the balance of power has shifted as ecologists worldwide protested this wanton destruction. Wildlife has become recognized at least as a major tourist attraction and the source of a larger part of East Africa's foreign exchange earnings. In 1977, the Kenyan government imposed a ban on hunting, thereby protecting the wildlife, but alienating farmers. And so the battle continues.

Much of the problem has been due

to a lack of understanding of the role of wild animals as reservoirs and transmitters of diseases of importance to livestock production and human health. Not until the early 1960s was the need for research in this field recognized. In 1967, a project to develop a sound understanding of wildlife disease and its importance to the economic development of the region was launched at the Veterinary Research Laboratories of the Kenyan Ministry of Livestock Production. Initially supported by the Food and Agriculture Organization of the United Nations (FAO), the project is now funded by the Canadian International Development Agency (CIDA): IDRC manages the CIDA funds.

The project has helped dispel some myths about disease transmission and may lead to a more peaceful coexistence between wildlife and domestic animals. In fact, it has been shown that disease transmission between wild and domestic animals is less significant than was once thought. Three major risks are reported: Theileriosis or East Coast Fever (ECF), a parasitic disease carried by the brown ear tick harboured by buffalo; Malignant Catarrhal Fever (MCF), a viral disease transmitted by the wildebeest; and trypanosomiasis, of which buffalo and giraffe are the main reservoirs.

Theileriosis is a major constraint to livestock production in Africa. In East Africa alone, some 500 000 cattle die each year as a result of infection, and records show that animals that recover are infertile. Although 30 wild ruminants were found to harbour theileriosis parasites, only the buffalo carried the *T.*

*lawrencei* species that is suspected of playing a key role in causing ECF.

Although scientists hope that effective drugs for the treatment of ECF can be found, research on the control of the disease has been complicated by the discovery that buffalo may harbour more than one strain of *T. lawrencei*. The role of different theilerial parasites will now be studied in an attempt to find a cure for the disease.

Because of the serious losses caused by Malignant Catarrhal Fever, cattle ranchers and Maasai pastoralists whose properties border Kenya's game parks have demanded the elimination of wildebeest from their fields. Although the exact mode of transmission of MCF is not known, cattle appear to contract the disease when grazing with wildebeest during the latter's calving season. Researchers have isolated the virus from the nasal and eye secretions of calves less than three months old, suggesting that wildebeest calves are the most important source of the disease. And while almost all the infected cattle die, the wildebeest calves recover.

Attempts to control MCF have so far failed, and the only effective method of protecting livestock is to isolate them from the wildebeest for at least three months following wildebeest calving.

Of all the diseases, trypanosomiasis presents the most complex interactions between wildlife, humans, and domesticated animals. Wild animals are known to act as reservoir hosts for human and livestock pathogens. In livestock, at least three major species of trypanosomes are involved, each causing dif-



ferent diseases. An estimated 60 million cattle are infected in Africa, and mortality can reach 70 percent.

However, some animals seem to have a better immunological defense against trypanosomes than others. Imported cattle breeds have little or no tolerance, whereas indigenous breeds such as Zebu and Ndama fare better in tolerating the disease. Most wildlife appears to be highly susceptible to infection, but some resist the onslaught of disease very well (thus becoming living reservoirs).

As population pressures force livestock production onto areas where trypanosomiasis is endemic, research into the mechanism of host resistance — and the potential of strengthening or transferring it to domestic livestock — appears to offer the only practical solution. Wildlife, cattle, and trypanosomes must coexist, for the time being at least.

Other diseases were found to pose little risk to domestic cattle. The buffalo was the only wild ruminant commonly infected with foot-and-mouth disease, but the virus was not readily transmitted to cattle. Rinderpest, imported into Africa with domestic livestock, did not seem to have become established in wildlife, contrary to expectations. A pan-African vaccination campaign of domestic animals carried out in the 1960s has almost eradicated the disease.

A study of intestinal parasites of sheep showed that although Thomson's gazelle could carry species transmissible to sheep, the gazelle was not an important source of infection, although the two animals often graze together.

The findings suggest that domestic cattle and wild stock can safely coexist and may open the door for improved land use patterns in Kenya.

Domestic livestock have always had a greater economic importance to people than has wildlife. The rationale of controlling wildlife disease has been to protect investment by protecting the health of domestic stock. In recent years, however, the potential economic value of wildlife has increased. As the need to intensify production on limited land area and to conserve productive resources have become important concerns in agriculture, wildlife species have become feasible alternatives.

Areas that are of marginal value for agriculture and cattle ranching, particularly in dry areas, could be well-suited to wildlife utilization through game ranching. Unlike domestic livestock, wild animals do not require constant protection against tsetse flies and ticks, and some animals — like the oryx and the elan — do not require as much water as cattle.

According to Dr David Hopcraft, a wildlife rancher in Kenya's Athi River area, game ranching as an alternative to cattle could also have environmental benefits. Cattle can destroy pasturelands through overgrazing and through tracking, which causes soil compaction and erosion. No such problems were found with gazelle grazing on

similar pastures. Moreover, he says, gazelles produce 50-100 percent more meat per hectare.

But despite the advantage of wildlife ranching, the integration of wild and domestic animals has not been considered in most African countries. Dr Hopcraft attributes this to sentimental attitudes. "Because of the history of catastrophic destruction of wild animals," he says, "wildlife utilization has become an emotional issue." In Kenya, for example, it is illegal to harvest meat from indigenous African species raised on African lands.

"From the reasonable or logical point of view", he says, "if we are to look at conservation of our natural resources, particularly in dry lands, then we must find ways of keeping the true African animals."

There are obstacles to be overcome, however, before game ranching becomes widespread — the definition of ownership and costs of preventing poaching, for example. Research will also be needed to define the most

appropriate economic balance between the different systems of wildlife utilization.

According to the researchers participating in the project, policy and legislative changes are required if the findings of wildlife disease research are to be of greater benefit to domestic cattle production and rational wildlife management in East Africa. Education is also required to convince conservationists that land conservation and wildlife conservation go hand in hand.

The researchers consider nevertheless that the stage is now set for farmers and ranchers to be given financial incentives to allow game animals to share their land with livestock, thereby ensuring the continued existence of large numbers of plains game animals despite intensified livestock and crop production. □

*For more information, consult Wildlife disease research and economic development: proceedings of a workshop held in Kabete, Kenya, 8 and 9 September 1980, Lars Karstad, Barry Nestel, and Michael Graham, editors, IDRC-179e.*



(Facing page) Wildebeest, Kenya: Wildlife harbours disease, but may also hold the key to immunity against it. (Above) Ticks on the ears of cattle transmit parasitic East Coast Fever in livestock.



# NEW RELEASES

## MOBILIZING AGAINST MOSQUITOES

MARILYN CAMPBELL

Until recently, the only book ever published in the native language of the people of Tuvalu in the South Pacific was the bible. Now Tuvalu has a second book in the vernacular, on health and

what effect these mosquitoes, vectors of diseases such as malaria and dengue fever, have on the health of the residents. It also covers methods used to control the mosquitoes, and explains how the community can contribute to control programs. The section on how communities can help themselves is the most important one, as the education and mobilization of the people to rid the islands of mosquitoes is an essential part of this project.

It was thought that a simple text with cartoon-like illustrations picturing local customs and objects would have the greatest appeal for readers. Tuvalu health inspector Alefaio Semese and a small boy are featured on the cover. The text itself was written by Marshall Laird and Joseph Mokry

of Memorial University, Ropati Uili of the South Pacific Commission, and Alefaio Semese.

The booklet will be distributed through the Tuvalu Department of Social Welfare to established community groups, such as women's committees, for further free distribution. The aim is to have a copy in each of the country's 5000 households.

The distribution may take some time. The nine atolls, although they total only 25 km<sup>2</sup> of land area, are spread over 250 000 km<sup>2</sup> of the South Pacific. Each atoll is an overnight boat trip from its nearest neighbour. But sanitary aides on each will ensure distribution, and it is hoped the end result will be fewer mosquito-caused illnesses in Tuvalu.



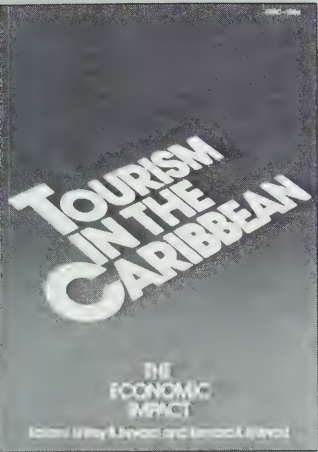
mosquito control on the nine atolls that make up the country.

The small eight-page booklet *Tu-ma mo te fakamutanaga o namu i Tuvalu* was produced by IDRC as part of its support for a project on biological control of mosquitoes in the South Pacific. The South Pacific Commission of New Caledonia and Memorial University of Newfoundland of Canada — a centre of world excellence for research on vectors and parasitology — are conducting the research.

The purpose of the booklet is to inform and educate the 8000 residents of Tuvalu on how and where mosquitoes breed in their islands, and







**Tourism in the Caribbean: the economic impact.**  
*Shirley B. Seward and Bernard K. Spinrad, editors. Published in June 1982, 163 pages. IDRC-196e.*

International tourism has become an important economic activity and its impact on host societies is of considerable interest to policymakers, planners, and academics. The detailed studies of the impact of tourism in four micro-economies of the Caribbean presented in this volume assess tourism's contribution to gross domestic product, employment, government revenues, and foreign exchange. The findings are compared and policy implications drawn. Areas for further research are also emphasized.

**Education, travail et emploi: revue sommaire,**  
*by Maureen Woodhall. Published in May 1982, 56 pages. IDRC-TS30f.*

Seven summary reviews and an overview examine the research undertaken into the relationship between education and employment in developing countries. Some of the main issues raised include education and worker productivity, the use of education in selection for employment, alternate methods of selection, and education and income distribution. (Also available in English and Spanish)

**Una decada de aprendizaje: Los primeros diez años de la División de Ciencias Agrícolas, Alimentos y Nutrición.**  
*Published in May 1982, 192 pages, IDRC-170s.*

This publication reviews the projects and programs of IDRC's Agriculture, Food and Nutrition Sciences Division during its first 10 years of operations. The history, philosophy, and style of the division are presented along with an examination of activities in each of the principal developing regions, a summation of experience, and an outline of future directions. (Also available in English and French)

**DEVINDEX 1980. Index to 1980 literature on economic and social development.**  
*Published in May 1982, 174 pages. IDRC-194e,f.*

The sixth volume in the IDRC DEVINDEX series, this publication contains entries from Canada, the Federal Republic of Germany, India, Morocco, the Netherlands, the Philippines, Sri Lanka, and the USSR.



**Renewable resources in the Pacific: Proceedings of the 12th Pacific Trade and Development Conference, held in Vancouver, Canada, 7-11 September 1981.**  
*H.E. English and Anthony Scott, editors. Published in June 1982, 293 pages. IDRC-181e.*

Fish, forest, and fuel problems are intricately

related in the world's ecological system. Indiscriminate exploitation of one of these by one sector incurs immediate external costs to another. The choice of appropriate mechanisms to reduce such costs, to enforce socially beneficial harvesting practices, and to capture the rents from the available resources were the recurring themes of this conference. This volume presents general and case studies from the 13 countries participating, summaries of discussion, and papers on policy issues. References and a list of participants are also included.

*To order these and other IDRC productions, please consult ad on back cover.*





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# LETTERS

## Not the solution

"The simple solution" by Lennox Grant (*Reports* 11(1) April 1982) makes me question the wisdom of IDRC's support for such a bandaid measure when one is dealing with severe gastroenteritis in infants without a concomitant emphasis on prevention.

A planned media campaign to promote breast-feeding is mentioned in passing. But what follows that sentence—"An attempt will be made to link the causes of the disease to poor environmental sanitation—the lack or shortage of piped water..."—is what leaves me flabbergasted. All the other initiatives will be done, but this one will only be "attempted".

Trinidad lies in the wet tropics with an abundant rainfall. A project which would document why the dams were not built, nor wells drilled, over the past 30 to 40 years, and show how the present suffering of children and their parents is related to that scandalous omission would have done more, in my opinion, to raise the blinkers off the eyes of the population and start them on the road to an eventual eradication of infantile gastroenteritis.

Incidentally, there does not seem to be any shortage of piped water for the production of Coca-Cola, recommended for infected toddlers.

J.M. Dubé, M.D.  
Nanaimo, Canada

*Editor's note: By introducing and promoting the use of oral rehydration therapy, the Trinidad project aims to reduce preventable infant deaths due to dehydration resulting from gastroenteritis. By developing, implementing, and assess-*

*ing a health education program, it is hoped that some of the causes of infantile gastroenteritis can be eliminated in the home.*

*The elimination of the root causes of infantile gastroenteritis and other diseases—poor sanitation and lack of clean water supplies—is largely beyond the scope of this small project, being carried out with the help of an IDRC grant of less than \$60 000 over three years. In the past 12 years IDRC has supported more than 50 projects in the field of water and sanitation in all regions of the world. Until the efforts of the International Drinking Water and Sanitation Decade succeed, shorter term solutions to immediate problems, such as infantile gastroenteritis, will continue to be needed.*

## Development: power and aid

In your article "Powering development" (*Reports* 11(1), April 1982) it would have been nice if the giants of biogas technology like China and India had been mentioned. Overlooking these two countries is just like discussing Zimbabwe's Power Alcohol Programme without taking into account Brazil's experience.

Also in the same issue, the commentary, "Towards a new interdependence of nations", mentions that the citizens of the former colonial powers do not agree that aid given to the colonies is an obligation because of the harm done during the colonial era. I feel that we in the former colonies would not require aid from our former masters was it not for the unjust world socio-economic order of the present, which the colonial powers can change if they wish to. If an obligation is not felt to

compensate for the harm done in the past, at least obstacles should not be placed in the way of countries trying to recover from the irreparable damage done.

Aliasgher E. Sheriff,  
Arusha, Tanzania

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports, P.O. Box 8500, Ottawa, Canada K1G 3H9.*

## UPDATE

### A better start, but no follow-up

According to some experts, the figures provided by Dr Anthony Myres on breast-feeding rates in Canada (*Reports* 11(2), "A better start") may be somewhat misleading. Mrs Ginette Chartier of the La Leche League in Montreal says that the practice of breast-feeding drops dramatically as soon as mothers leave the hospital. "A study of the Centre de Croissance of the University of Montreal revealed that if breast-feeding rates can reach 70 percent in the hospital, they drop to 40 percent within the first month and to less than one percent after six months. What do you expect?" she says. "Mothers leave the hospital with the baby under one arm and samples of infant formula under the other." Dr. Elizabeth Rousseau of Ste-Justine Hospital for children (Montreal) confirms these figures and attributes the discontinuation of breast-feeding to the lack of follow-up and support programs for mothers in the home.

## Computer messages

Computers are revolutionizing communications systems. Their speed, memory, and information capacity offer a mechanism for sharing messages that is particularly valuable for the exchange of scientific information.

Computer-based conferencing systems that build on these capacities have spread rapidly in industrialized countries. In 1981, IDRC supported a workshop that explored the implications of these systems for developing countries and concluded that they could become an effective tool for increasing and fostering scientific exchanges (*Reports* 11(1) April 1982).

The development of these systems requires government acceptance and support, however. Laws, norms, and institutional commitments pose potential stumbling blocks to their use.

To help Brazil and Mexico establish the policies needed for the effective use of computer conferencing systems, IDRC is supporting a study carried out by the Intergovernmental Bureau of Informatics (Mexico). In order to explore the current and potential use of these systems, the project will analyze laws, examine the telecommunications infrastructure, identify the applications of computer-based conferencing systems, and assess the potential benefits to Latin American countries.



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explorer* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition Jacques Dupont; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee

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**Cover:** Chest examination in Bangladesh. Research is providing new weapons for the battle against tuberculosis and the major tropical diseases. See stories page 4 and following.

Photo: David Maltby, CIDA  
**Back cover:** Winnowing rice in the Philippines. New technologies and varieties developed by a network of international centres increased yields by 40 percent. See story, page 24.

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*New strategies against  
tuberculosis and major  
tropical diseases*

# ON THE DISEASE WARPATH

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MICHELLE HIBLER

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**"T**he last few years have not been altogether favourable ones for world health", says the World Health Organization's Sixth Report on the World Health Situation. Certainly, nobody could accuse the who of exaggeration. Behind the diplomatic restraint lies a decade of proliferation of climatic calamities, wars and civil unrest, population growth, inflation, armaments, and dangerous chemicals.

"The situation remains less happy than might have been expected a decade ago." The report continues: some 800 million people live in abject poverty, 450 million are on the threshold of malnutrition; 300 million are unemployed.

And yet, against this bleak backdrop, the who expresses "guarded optimism" that the target of "health for all by the year 2000" will be reached. To do so will require no less than what the delegate from Malta described to the 34th World Health Assembly in May 1981 as "the implementation of a program of interspecific warfare."

That war will need to be waged on many fronts, against many enemies, including communicable and tropical diseases.

Some of the foes, like tuberculosis, are well known. March 1982 marked the centenary of the discovery of the tubercle bacillus by Robert Koch. The years since have known many milestones: 1921 saw the discovery of BCG, an attenuated form of the bacillus used in vaccination. In 1944,





streptomycin was discovered, the first of many cheap and effective drugs. Mass TB eradication campaigns were launched.

But today, all regions report tuberculosis as one of the most important public health problems. The number of cases, estimated at 20 million, is growing annually by 3.5 million.

Like many other diseases, tuberculosis is associated with poverty, malnutrition, overcrowding, and poor sanitation, conditions that developing countries know only too well. But even in the industrialized North, where the disease is considered to be an anachronism, it causes more deaths than all other notifiable infectious diseases combined. In Canada, some 2500 new cases are reported each year.

The cornerstones of TB control are prevention, case-finding, and chemotherapy. All are difficult to effect in developing countries. Accepting that the conditions that foster the spread of the disease will not be changed in the near future, prevention rests on vaccination. But although mass BCG vaccination campaigns began in the late 1940s, coverage has been spotty. A case in point is Pakistan where only one million of the country's 33 million children are vaccinated annually.

Despite doubts cast on the efficacy of BCG following a study in South India that showed that the vaccine did not protect the population, the vaccine remains a first line of defence. "It's still the best way of preventing TB and meningitis in children", says Dr Albert Laszlo of the National Reference Centre for Tuberculosis (NRCT), Ministry of Health and Welfare Canada. The Canadian centre is also a WHO Tuberculosis Reference Centre.

Tuberculosis case-finding has moved away from X-rays, which are expensive and potentially dangerous, to microscope examination of sputum samples — smears — from people who present themselves to clinics with chest complaints. "But if there's no clinic, where will the patient come for treatment? And if there's no microscope, who is going to diagnose the case?" asks Dr Laszlo.

Who agrees that case-finding in many developing countries has been unsatisfactory. In Africa, for example, not more than 30 percent of cases are detected.

The use of cultures would add to the number of diagnosed patients, but cultures are expensive, require equipment and trained personnel, and may take up to six weeks. It is difficult to keep patients under observation for that length of time. And "for every patient lost, you get six more cases," adds Dr Laszlo.

That time may be greatly reduced in future by the use of a semi-automated diagnostic tool. The equipment — a BACTEC 460 machine — measures the carbon dioxide released by the bacillus. Developed by Dr Middlebrook in the U.S.A., the method consists of inoculating a radioactive culture me-

dium with the sputum sample. After 24 hours' incubation, the samples are fed through the machine, which measures and records the carbon dioxide content, at the rate of one sample per minute.

Testing of the BACTEC 460 has been going on for three years in the Laboratory for Disease Control (LCDC) in Ottawa where the NRCT is located. But Dr Laszlo warns that "it's quite unthinkable to have one in labs all around the world." At about U.S. \$20 000 the machine may be affordable, but its operating costs are high — each vial of culture medium containing radioactive carbon isotopes ( $C_{14}$ ) costs \$2 — and its operation required sophisticated installations and trained personnel.

"A case could be made for having one in a central lab or at a national reference centre, however," says Dr Laszlo. But cost-benefit studies are needed before the equipment's introduction can be recommended. The LCDC is now preparing protocols and has entered into discussions with IDRC for a trial in Latin America. Dr Laszlo



A TB clinic in Venezuela (above). (Opposite page) An Egyptian researcher tests a local weed against the snail vector of schistosomiasis.

considers that the value of this new tool will probably be in measuring drug susceptibility of bacilli from patients who are not responding to treatment.

Of the many drugs available for TB treatment, a combination of three is normally used — streptomycin, isoniazid, and PAS or thiacetazone. "The response is 99 percent positive if patients take their medication," says Dr Laszlo.

And that's the problem. To effect a cure, patients must take the drugs for 18 months. As disease symptoms disappear after three months, many patients discontinue their medication. According to WHO, not more than half the diagnosed TB cases are cured in developing countries.

Shorter term therapies developed to solve this problem are being tested. In Kenya, for example, the Tuberculosis

Investigation Centre is carrying out research on a six-month treatment. Although effective, it relies on isoniazid and a new drug, rifampin, which is very expensive and requires medical supervision. In order to make rational decisions about the program's management, a TB prevalence survey is needed. IDRC is supporting this survey.

The aim of tuberculosis research, says Dr Laszlo, "is how to treat the most people at the lowest possible cost to stop the spread of the disease." Simple means of identifying high risk populations would assist in that task. Thus, IDRC is supporting a project in Indonesia that is investigating the prevalence of TB in underweight patients at a Jakarta Chest clinic. If a relationship can be found between body weight and TB incidence, health workers will be better able to target their control efforts.

If weapons and tactics exist for defeating TB, the case is quite different for the "big six" targeted by the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases — malaria, schistosomiasis, filariasis, trypanosomiasis, leishmaniasis, and leprosy (see box, "Most wanted").

Each of these diseases affects millions of people, and is daily making new conquests. All have resisted control. No vaccines exist to protect against them, and few safe, effective drugs are available for mass treatment.

The search is therefore on, not only to find new weapons, but to take a fresh look at existing tools and to find ways of making more efficient use of what is available.

In the five years since the program became operational, some 1780 projects have been supported, ranging from the most sophisticated laboratory investigations to simple field testing of diagnostic methods. According to Dr Adetokunbo O. Lucas, Director of the Special Programme, "in the last five years major advances have been made." But these advances, although not negligible, are far from spelling victory.

The most notable success is probably in vector control, particularly of blackflies that spread onchocerciasis, says Dr Alex B. Morrison, Assistant Deputy Minister of Health and Welfare Canada and member of the Special Programme's Scientific and Technical Advisory Committee (STAC). "We are particularly excited by the great promise shown by *Bacillus thuringiensis* H14, a biological control agent which is now on the verge of large-scale production. Extensive testing has been carried out against blackfly larvae in West Africa with excellent results. The timing of the development of *B. thuringiensis* is extremely fortunate. This agent promises to be of great value in controlling blackflies, at a time when the onchocerciasis control program is encountering resistance to the pesticide used, Abate."

*B. thuringiensis* is also a potential weapon against mosquitoes, vectors of malaria, yellow fever, dengue fever,



and filariasis. Its effectiveness as a pesticide for agricultural use has been known for two decades, but only one recently discovered strain — *v. israeliensis* — is effective against mosquito larvae. It is now being tested in the South Pacific with IDRC support.

Malaria research has received the most attention and funds. Following the early success of the worldwide antimalaria campaign launched in the 1950s, hopes soared that the disease could be eradicated. By the late 1960s, however, the global eradication program was in its death throes. Today, malaria is on its way to becoming what one former chief of program and planning in WHO's Division of Malaria Eradication termed "the health catastrophe of the twentieth century."

The biggest problem is the increased resistance of the malaria parasite, *Plasmodium falciparum*, to drugs. A detailed survey of the situation has shown that resistance to chloroquine — the foundation of prevention and treatment — has spread since 1960 from Thailand and Colombia to large parts of Asia and South America. It is now also reported in East Africa. And according to Dr Morrison: "Resistance to sulfadoxine pyrimethamine (Fansidar), the most important alternative drug, is spreading rapidly in Southeast Asia

and South America and resistance to quinine, the oldest antimalarial drug, appears to be rising."

New drugs are being developed and tested. Mefloquine, developed by the Walter Reed Army Institute of Research in the U.S.A. has undergone clinical trials and is effective. It is very expensive, however, and resistance is already reported in parts of Thailand. Very promising is Qing Hao-su, originally a traditional Chinese herbal remedy. Because its chemical structure is entirely different from other malarial drugs, it opens the prospect of a new family of drugs.

On the vaccination front, the discovery of the hybridoma technique is allowing researchers to produce highly specific antibodies to parasite antigens. The technique consists of fusing an infected cell to a fast-dividing cell and growing the hybrid in a culture medium. The hybrid cells that secrete the needed antibody are then cloned. But, cautions Dr Morrison, "if an effective vaccine can indeed be produced — and we believe the possibilities are good — we cannot realistically expect it to be applied at the field level within less than a decade."

Through the Special Programme, much knowledge has also been gained about other diseases. For example,

little was known about leishmaniasis. An epidemiological picture has now revealed that it is much more widely distributed than was previously thought. Most affected are the Middle East, parts of India, and the frontier regions of Latin America.

The northeastern region of Brazil, for example, is an endemic area. Known reservoirs of the disease are dogs, foxes, and humans. Dogs seem particularly important because they offer the sandfly vector easy access to infected skin lesions. IDRC is now supporting a study in the city of Jacobina to determine the importance of animals in the transmission of the disease. WHO's program, for its part, is focusing on better understanding the disease and on the development of a vaccine.

Drugs and vaccines are also being sought against schistosomiasis. One new drug — praziquantel — has been found effective and less toxic than previous drugs. A simple method of diagnosis has also been developed for field use.

Similarly, simple and inexpensive diagnostic tests were developed for African trypanosomiasis. Work on the American form of the disease — Chagas' disease — has focused on discovering its distribution and varieties.

Only in the case of leprosy is a vaccine close to reality (see article on page 8). Progress is also reported in the development of diagnostic tests.

These developments are particularly significant as a considerable part of the research is being carried out in developing countries. Dr Lucas explains that the Programme's strategy "is to begin strengthening a few key institutions in different regions so as to provide students in the developing world with the opportunity for training and research within their own environment. . . . Eventually, provided the foundations are carefully laid, we expect it to have a snowball effect."

A weak point of the Special Programme remains the actual field work. According to STAC, a strong and national commitment is needed for this component to be successful.

That commitment has been made, at least verbally. In 1981, the 34th World Health Assembly adopted a global strategy to reach the "health for all by the year 2000" target. Whether or not the next 18 years will see a campaign of "interspecific warfare" conquer disease and ill health depends on whether the rhetoric is translated into action.

The victory over smallpox is proof that the larger battle can be won. But again, as the delegate from Malta pointed out to the Assembly: "There are several other victories we could be in a position to celebrate in the future, if we could only learn to direct our attention and our resources towards those species which are in direct and constant competition with us in the struggle for survival, rather than utilize a substantial portion of our energies in devising better ways and means of exterminating ourselves." □

## MOST WANTED

**Malaria:** A debilitating, often deadly parasitic disease, it is transmitted by the Anopheles mosquito. Malaria affects more than 200 million people in 107 countries. During the past five years, the number of cases has more than doubled.

Resistance of the *Plasmodium falciparum* parasite to available drugs is spreading throughout the world. Moreover, 51 species of the Anopheles mosquito are resistant to one or more insecticides.

**Schistosomiasis:** Over 600 million people in 73 countries are exposed to this parasitic disease: some 200 million are infected. The schistosoma parasite is transmitted by snails that are multiplying as rapidly as water development schemes provide them with new homes.

**Filariasis:** One of the most pathogenic forms of the disease is onchocerciasis (river blindness), transmitted by the blackfly, *Simulium damnosum*. At least 20 million people are infected in Africa, the Yemen, and parts of Latin America.

Lymphatic filariasis (*Wuchereria* and *Brugia* infections) affect more than 300 million people. It is transmitted by the ubiquitous mosquito.

**Trypanosomiasis:** Evidence points to an epidemic resurgence of this debilitating parasitic disease. In Africa, 45 million people are seriously threatened. The tsetse fly, carrier of African trypanosomiasis (sleeping sickness) has the dubious hon-

our of being the only important vector of disease that is without reported resistance to pesticides.

Chagas' disease, or American trypanosomiasis, affects the heart muscle. Some 24 million people are infected and 65 million are at risk. It is transmitted by Triatomid bugs: various animals act as reservoirs.

**Leishmaniasis:** Some 12 million people on all continents except Australia and Antarctica are estimated to be affected by the various forms of this little-known disease. The parasite is transmitted by sandflies: various animals act as reservoirs.

There are three forms of the disease: The cutaneous form manifests itself either as a single tropical sore or as a diffused infection; the mucocutaneous form (espundia) causes irreparable disfiguring lesions; kala-azar, the visceral disease, is usually fatal if untreated.

**Leprosy:** Known since ancient times, this bacterial disease affects an estimated 10 million people. Humans are the sole transmitters. No diagnostic tests are yet available to detect the disease before clinical symptoms appear — some 3 to 9 or more years after infection. Some evidence suggests that BCG vaccination confers some protection. A specific vaccine is now about to be tested. The disease is showing signs of resistance to dapsone, the main therapeutic drug.



# HEPATITIS B: NEW HOPE IN THE STRUGGLE

MOUSTAPHA MBODJ

**"H**évac B" is ready. The vaccine against viral hepatitis developed by a joint team of researchers from the Virology Institute in Tours, France, and the Faculty of Medicine and Pharmacy of the University of Dakar, Senegal, received the endorsement of the Francophone scientific community during the recent "Medical Days of Dakar", a conference held in the Senegalese capital in January 1982.

Working on the assumption that there is a connection between hepatitis B, cirrhosis of the liver, and cancer of the liver — a hypothesis advanced as early as 1956 by the Dakar School of Medicine — the Senegalese authorities are contemplating a mass vaccination campaign against viral hepatitis, with the eventual goal of eradicating cancer of the liver.

The vaccine exists. The Pasteur Institute in Dakar, which will become a production centre for Hévac B, estimates that it will be able to provide the Ministry of Public Health with 300 000 doses by April 1983. Production capacity is in fact expected to reach the level of one million doses per year. However, preparations for the actual execution of a mass vaccination campaign are only in the most preliminary planning stages.

Much ground had to be covered to get even this far. For a long time, Western specialists thought that type B hepatitis occurred exclusively in a hospital environment and was linked to the frequency of blood transfusions in patients, or with infection through accidental prickings with contaminated needles in the case of hospital staff.

Although clinically unknown in Africa, "syndrome disease" was in fact endemic. But it was not until the discovery of the hepatitis B virus by Baruch Blumberg, an American, winner of the 1976 Nobel Prize for Medicine, that the prevalence of the disease in Africa came to light. With the help of newly developed techniques for identifying the virus in blood, epidemiological studies were able to show that viral hepatitis was a major public health problem in Africa. Research into the cause of the high rates of infection is continuing, but it is suspected that the virus is transmitted by all human secretions (blood, sweat, sperm, and so forth).

Philippe Maupas, a French student of Blumberg's impatient with the slow pace of research, decided to push ahead independently on an anti-hepatitis B vaccine. He experimented successfully on himself and on "high-risk" adult



*Almost all children in one region of West Africa carried the hepatitis B virus by the time they were 12 years old.*

subjects in hospitals in France. At the same time, the need to protect not only hospital staff — the prime candidates for such a vaccine in the West — but also African children, was recognized. The vaccine was all the more important in Africa because of its potential as the first vaccine to offer protection against a deadly cancer: The relationship between the incidence of hepatitis B and of cancer of the liver appears almost certain.

The first major vaccinations began in 1976 in Senegal. The vaccine was first tested on pregnant women and newborn infants in the Sine-Saloum region (in the heart of Senegal's peanut belt), where viral hepatitis and cancer of the liver are prevalent. Previous studies had shown that infection occurred during the first years of childhood. Although antigen HB (the hepatitis B virus) is found only in 1.6 percent of newborn infants, the infection becomes much more frequent during the first six months of life. Subsequently, the process accelerates, becoming especially rapid between 19 and 24 months. Three-quarters of the children between the ages of four and five years carry the virus. The figure rises to 91 percent in young people aged 12-13.

Health planners therefore decided to vaccinate pregnant women in order to protect children from the start. Professor Bernard Digoutte, director of the Pasteur Institute in Dakar, stresses that this presents no risk for women or fetuses, "since the vaccine concerned is killed or inactivated, consisting only of the viral envelope."

Professors Maupas and Diop Mar next turned their attention to the vaccination of children two months to two years of age. The first campaign of this type, carried out in October of 1978, reduced the incidence of the virus by

85 percent, practically the same result obtained in the inoculation of pregnant women. More than 2000 children under 13 years of age have also been vaccinated in Siné Saloum.

Philippe Maupas, who died on February 6, 1981, had wanted to see a unit established in Africa for the production of his vaccine. The Pasteur Institute has chosen Dakar as the production site because it has an abundant supply of HB antigen, the hepatitis B virus — almost everyone in the city is a carrier.

What will it cost to produce the vaccine? Vaccination with the French vaccine requires three injections at monthly intervals, and one booster shot the following year. One dose of the French vaccine costs 4250 francs CFA (U.S. \$13), and one dose of an American vaccine developed last year (of which three doses are necessary) costs between 7750 and 12 400 francs CFA (U.S. \$24 and \$40). It was thus not without reason that during the "Medical Days of Dakar", Senegal's head of state, Abdou Diouf, cautioned researchers to look beyond the exclusively scientific aspect of the question and focus, particularly, on helping the country define an affordable health strategy.

As far as costs are concerned, the French affirm their involvement in this vast project and pledge their full support. "We do not know what such an operation will cost because this information is not available at this stage, but we will supply the vaccine at a very low cost," said Professor Digoutte. The Pasteur Institute will financially support the pilot campaign of mass vaccination in order to test the effectiveness of the vaccine.

The vaccination protocol also poses a problem for researchers. The need for three injections, followed by a booster, is bound to create difficulties in a rural area and among a population difficult to convince of the need to be vaccinated four times for the same thing. Even in 1978, follow-up was difficult. It is expected that there will probably be many "no-shows" among those who receive the initial shot.

The goal of developing an anti-hepatitis B vaccine — which in Africa also affords protection against cancer of the liver — has been achieved. It is effective and holds great promise for protecting the health of people in West Africa. However, much remains to be done logistically, financially, and socially before its promise as a true mass vaccine can be realized.



JOHN BLAIR

# LEPROSY

## GUARDING AGAINST THE ANCIENT ENEMY

**H**ealthy Americans and Europeans will volunteer by the hundreds this year to receive shots containing killed leprosy bacilli. The immunization experiment and the simultaneous work to develop new drug treatments for patients already affected by the disease mark major advances against one of humanity's most persistent enemies.

As the volunteers in the international research effort recognize, leprosy, also known as Hansen's disease, is not something that vanished with the Middle Ages. The untreated disease, caused by the tuberculosis-like bacterium *M. leprae*, damages the nerves and often causes disfigurement. It may affect as many as 15 million people. Estimates that 3.5 million Indians, almost 300 000 Brazilians, and one in 40 citizens of Zaire have the infection demonstrate the endemic situation in the Third World. World Health Organization (WHO) authorities assert that less than half, and perhaps as few as one-third of the people with the disease receive the drug treatments that arrest the sickness and render it noncommunicable. Almost as alarming is evidence that *M. leprae* has begun to develop resistance to the cheapest medication, dapsone (4,4'-diamino-diphenyl sulfone, or DDS).

The spectre of drug resistance (occurring in 40 percent of Mali's new cases of leprosy), as well as the fact that most people do not come in for initial treatment until long after they have reached the infectious stage, makes immunization the ideal method for complete control. Because the only known reservoir for transmitting leprosy to a human is another human, the vaccination weapon against the disease seems especially appropriate. With such a tool, it eventually might be possible to eliminate the sickness from the face of the Earth, just as WHO did during the last decade with smallpox.

Until recently, scientists could not cultivate *M. leprae*, the basic component of a vaccine, outside the body. Discovered in 1873, the bacterium was the first such organism ever to be identified as a cause of human disease. But 109 years later, researchers have not been able to make it multiply in a test tube. Yet John H. Hanks, who has kept a form of rat leprosy alive *in vitro* since 1979, is optimistic that his techniques can be refined to grow *M. leprae* as well. Although it may take



considerable time to achieve such a laboratory victory, Hanks and his colleagues at Johns Hopkins University Tropical Medicine Center, in Baltimore, U.S.A., say they are already halfway there.

A second option for producing the bacterium is to grow it in a laboratory animal that can be sacrificed, but it took until 1971 to find an animal capable of producing the microbes in quantity: the armadillo. Nine special farms with over 300 animals have been created since Waldemar F. Kirchheimer and Eleanor E. Storrs first observed *M. leprae* in their experimentally inoculated armadillos. Today, the laboratory armadillos are being harvested for their abundant bacterial crops.

According to Barry Bloom, coordin-

ator of WHO's leprosy immunization program (IMMLEP), the highly susceptible animals generate 100 to 1000 times more microbes per gram than human tissue. He points out that in humans the organisms are restricted to the cooler skin regions, but in the low-temperature, weakly immune armadillos, the body invasion is total within three years. "Ten billion bacilli can be obtained from a single gram of liver tissue," Bloom declares. "Enough for possibly 1000 to 10 000 doses of vaccine."

Last year biochemists at the British National Institute for Medical Research used U.S. material to produce a killed-*M. leprae* vaccine free of armadillo tissue contaminants. The purified vaccine's protective power



has since been proven in animal tests by Kirchheimer at the U.S. Public Health Service Hospital in Carville, Louisiana, Charles Shepard at the Center for Disease Control in Atlanta, Georgia, and Bloom at New York's Albert Einstein Medical College. The human trials, which will begin within the next few months, will be aimed at finding the vaccine's optimal dosage and its effectiveness over time, as well as spotting any potential side effects. Bloom asserts that the worst side effect that a volunteer might have is a sore arm.

One of the vaccines that WHO will consider for trials in endemic countries within the next three years will be such a combined preparation. Bloom cites the experiences of Venezuelan Jacinto Convit, director of the National Institute of Dermatology in Caracas' Pan American Center for Research and Training in Leprosy and Tropical Diseases. Convit inoculated patients suffering from lepromatous leprosy with

*Some leprosy vaccines show promise. But bringing immunization services to remote areas, here in Venezuela, may be difficult.*



*Research makes progress in the prevention and treatment of leprosy, but public ignorance and fear are aspects of the disease for which no scientific working group has a ready solution*

Although Europe has not had a substantial outbreak of leprosy since one in Norway in the 1850s, and the United States currently has only several thousand persons under treatment for the disease, the selection of the two regions for the first trials sidetracks any possible charge that Third World people are being used in unproven experiments.

The tests on either side of the Atlantic should also provide valuable additional data. All the Europeans have received the tuberculosis vaccine BCG. The Americans have not. In bacterial terms, leprosy is closely related to tuberculosis. Some experts even speculate that the disease lost its epidemic hold on Europe only when the faster-acting tuberculosis bacilli killed off people that would have been susceptible to leprosy. Specialists will be watching closely for differences in the skin tests of the TB-immunized Europeans and their American counterparts.

Most immunologists do not expect the *M. leprae* vaccine alone to wipe out live bacilli in a person who already has a subclinical infection. At best they hope the inoculations would give such individuals enough immunity so that if the disease eventually manifests itself, it will be the less severe tuberculoid variety that is readily treatable with drugs, or even self-healing. The *M. leprae* vaccine combined with BCG vaccine, however, might knock out the slowly incubating leprosy bacilli in such individuals and keep them disease-free.

a mixture of tuberculosis vaccine and killed-*M. leprae* bacilli. Not only did the volunteers develop immunity and thus recover from their severe form of the disease, but they did so without drugs or nerve damage. Convit wants to use his therapeutic medication as a preventive vaccine. He has already used purified *M. leprae* to create a skin test that identifies persons who should receive such a vaccine.

Although Convit has submitted plans to WHO for an inoculation campaign in the endemic areas of Venezuela, the logistics of a pilot field trial are awesome. Family members and acquaintances of patients, who have a sixfold higher risk of the disease, could be vaccinated for control studies. But because of the slow incubation period of the disease, systematic checkups would have to be conducted for 10 to 15 years. Health authorities will have to be alert for the slightest variation in vaccine results. For example, if the vaccine proves more effective among people inoculated in childhood than among those immunized as adults, it could be important for future efforts.

A mass general vaccination campaign involving hundreds of thousands, perhaps millions, of people could then be launched.

Robert C. Hastings, chief of the U.S. National Hansen's Disease Center pharmacological division, points out that the vaccination effort must be "sustained," noting that in many areas of the world paralytic polio is still ex-

tremely common 20 or more years after a cheap, safe, and essentially permanent vaccine has been made available. He adds, "A massive program of public health education, mobilization, delivery and follow-up will be required."

Plans for distributing and testing leprosy vaccine—an activity that would have been inconceivable only a few years ago—are at the top of the IMMELP agenda. Convit, with Venezuelan government approval, may be the first to venture into the mass vaccination field. Another of the WHO's task forces has meanwhile moved to improve the chemotherapy of patients. Regimens have been developed that use drug combinations to help the small minority of sufferers whose infection cannot be suppressed by any one medication. Studies of dapsone resistance, along with efforts to develop new drugs, are under way. The creation of analogs of clofazimine, thalidomide, and cycloserine are being given the highest priority.

Another field trial that is especially important to persons with Hansen's disease concerns the withdrawal of chemotherapy from persons who have received two years of intensive treatment with multiple anti-leprosy drugs. If the relapse rate is low (no greater than one percent per year) hundreds of thousands of persons who show no clinical sign of *M. leprae* could be released from the obligations of regular medication.

Public ignorance and fear of leprosy are aspects of the disease for which no scientific working group has a ready solution. Although at least 90 percent of the population is apparently immune to the sickness, and only a small percentage of those who are susceptible could ever come down with active symptoms of the disease, the stigma is still there. Bloom calls this feeling "a disease of the mind" that "affects the lives, psychology, socialization, as well as the health of the people."

Brazilian scientist Dr Abraham Rotberg argues for the substitution of the term "Hansen's disease" for leprosy. He says that renaming the sickness after the Norwegian discoverer of the bacilli would "dissociate the disease from centuries of ignorance, infamy, and prejudice."

Bloom, however, thinks that the stigma will disappear only when people realize that the disease can be prevented and cured. Progress toward that goal in the last 10 years has, in his words, been "extraordinary." "Immunology, biochemistry, and combined chemotherapy all are contributing new data to the effort. Who put all the information together through its network of cooperation. It couldn't be done alone in England, the United States, Venezuela, Ethiopia, or India. All are pulling together and sharing material. It doesn't happen often in science, but it is happening." □

*John Blair is a Washington-based science and development writer.*



# SURE SHOTS

BOB STANLEY

**E**very year millions of children in the tropics receive vaccinations against measles that give them no protection at all. The reason for this startling statistic is that vaccines deteriorate rapidly as the temperature increases.

A vial of measles vaccine, for example, is good for 54 days at a temperature of 25 degrees Celsius. At 37°C its life is reduced to 12 days at most. But there is no visible sign of deterioration, no way in which the health worker administering the vaccine can detect the fact that it has expired. Polio vaccines deteriorate in a similar fashion.

The World Health Organization's Expanded Programme for Immunization (WHO/EPI) states bluntly: "The biggest stumbling blocks to successful immunization programmes are not medical or technical, but the practical difficulties arising from field operations... keeping vaccines safe and effective from manufacture to child."

Nobody knows for sure just how many children receive useless measles vaccinations each year, but estimates vary between 10 million and 16 million. Given an estimated 10 percent mortality rate from measles in the tropics, and assuming that 30 percent of unprotected children contract the disease, that means at least 300 000 potential child deaths annually, according to Dr Patrick Tam, program officer for the Program for Appropriate Technology in Health (PATH).

Dr Tam, a bio-engineer, is responsible for coordinating the development of a little red sticker that promises to solve this problem. The

sticker's active ingredient is a chemical called 2,4-hexadiyne-1,6-(p-toluenesulfonate), more conveniently known as PTS. Exposure to heat causes PTS to polymerize — a shifting of molecules that results in its changing colour. The higher the temperature, the more rapid the change.

The sticker is called a time-temperature indicator. It was devised initially by Allied Corporation in the U.S.A. But Allied estimated it would cost them from U.S. \$4 million to U.S. \$5 million to develop the indicator for mass production, and that they would be unable to recover their investment. PATH, a non-profit organization, based in Seattle, U.S.A., heard about the invention, developed a proposal for a one-year feasibility study of Allied's prototype indicator, and obtained 95 percent of the funding it needed from IDRC and the Edna McConnell Clark Foundation, of New York. The total cost of this initial project was just Cdn \$168 900.

The PATH researchers found that the indicators could be manufactured to closely parallel the rate of degradation of measles vaccines obtained from major manufacturers, and that they could be pre-aged to match the WHO/EPI recommended standard of seven days maximum exposure at 37°C.

The single-vial indicators are attached to the tops of vials so that health workers cannot fail to notice if the red colour has changed to brownish-black indicating expiry. Successful preliminary field tests were carried out in Mexico, the Philippines, and Indonesia. Connaught Laboratories, of Toronto, Canada, which is collaborating with PATH on the adaptation of the indicator for use with polio vaccines, carried out

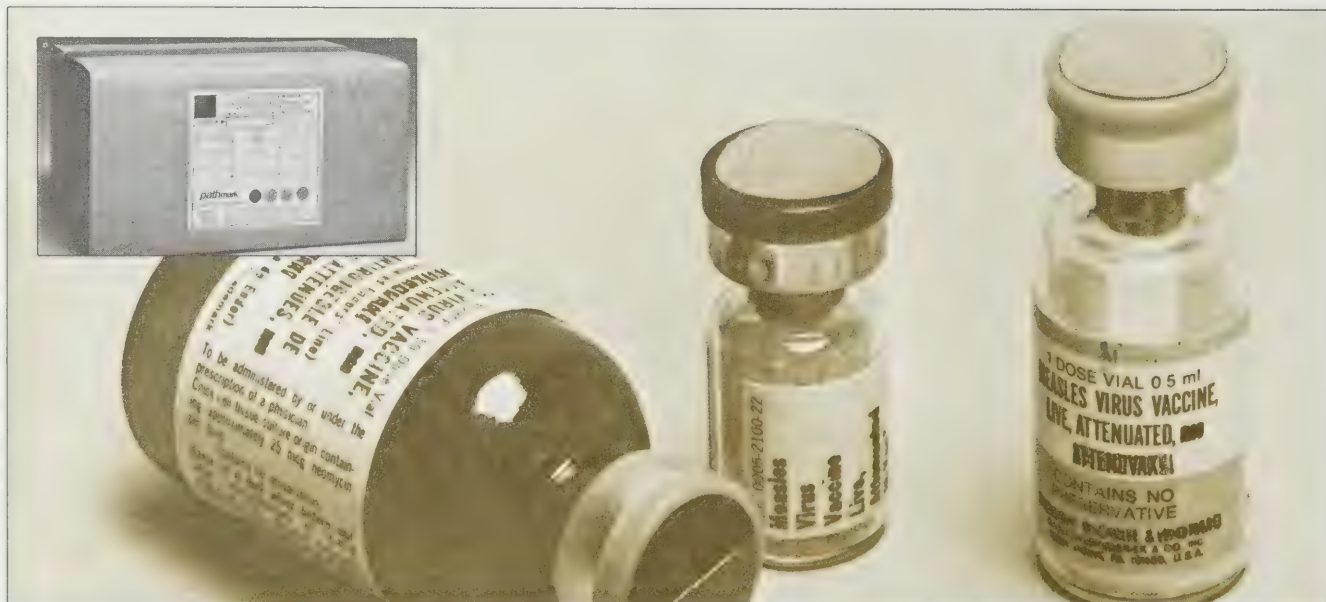
additional field tests in Pakistan at its own expense. More tests are also being conducted in the People's Republic of China.

The second phase of the project, due to be completed in 1983, cost a further Cdn \$268 000, with additional funding coming from Oxfam of the United Kingdom and WHO/EPI. Another Canadian vaccine manufacturer, the Armand Frappier Institute of Montreal, is also involved. More extensive field testing is being carried out in Africa, Asia, and Latin America in this phase, and the exercise will also help to introduce the concept of visual indicators into many ministries of health.

The technical problems to be overcome in order to bring the indicators into mass production are considerable, but not insurmountable, according to Dr Tam. And mass production is essential, he says, to keep the eventual cost of the indicators as low as possible.

The PTS compound is to be formulated into an ink suitable for printing presses, and machinery has to be developed for mass application of the indicators on individual vials and on shipping cartons. Manuals have to be prepared as a first step to the transfer of the technology. And finally, an agreement on royalties has to be finalized with Allied, who will retain the patent on the invention until the early 1990s.

The project is a rare example of international cooperation between public and private enterprise. The winners will be the millions of children in the Third World for whom the little red stickers will mean "sure shots". □



Colour changes in labels on vials or boxes indicate vaccines' deterioration.



# A QUESTION OF SOLIDARITY

JACQUES DUPONT

"Among the many factors that make it possible for a society to provide for the welfare of its members and to improve their standard of living, the ability to define and solve problems is of prime importance," said Mr Ivan L. Head, IDRC president, at the beginning of the conference. "This ability is the 'capacity for research.'"

This capacity for research and invention, long established in industrialized countries, appeared later in developing countries. Just how much later was first brought to world attention in 1963, during the United Nations Conference on Science and Technology for Development in the interest of less-developed countries.

In 1969, the World Bank's Commission on International Development, headed by Lester B. Pearson, again considered the problem. The Pearson Commission estimated that, at maximum, only three percent of the world's scientific and technical research was being conducted in developing countries.

Quebec is also relatively new to the field of research and development: Its experience dates back no more than 20 years. At that time, Quebec very quickly moved from an essentially rural economy to a post-industrial one. This rapid change in the socioeconomic structure of its society had numerous consequences. One of the most important was the radical transformation of the educational system at the beginning of the 1960s: a vast network of primary and secondary schools, then colleges, and finally new universities sprouted throughout the province. Research and development activity began in earnest once this infrastructure was in place.

Quebec's budding experience in research and development is rooted in a history that is to a large degree similar to many developing countries: one that saw a rapid transition from a rural to an industrial society; headlong expansion of the educational system; an economy based on a network of small- and medium-sized industries; and the need to concentrate development efforts and provide coordination.

According to Mr Yvan Cliche, president of the executive committee and

*Close to 250 people, for the most part Quebec university professors and researchers, took part in a Conference on Research for International Development held at the University of Quebec at Trois Rivières, April 29 and 30, 1982.*

*The conference was organized jointly by the University of Quebec, the University of Quebec at Trois Rivières and IDRC. It aimed to identify Quebec's potential for research that could be carried out in cooperation with Third World institutions, and to provide the Quebec scientific community with information on IDRC's experience in research assistance in the Third World, particularly in areas of interest to Quebec.*

general director of the Fonds de formation de chercheurs et d'action concertée (researcher training and concerted action fund). "It is possible that the speed with which change took place in Quebec stimulated our creativity; at the very least, it tested our ability to resist change and put us in touch with the world. Because of this, Quebec can probably understand better than others the anxiety of countries faced with a similar transition in just as short a time."

One source of anxiety is technology transfer. Mr Rogerio Cerqueira Leite, formerly vice-rector of Brazil's Campinas University and currently a professor there, startled the conference participants somewhat when he asserted: "If one percent of the promises contained in the countless international agreements and accords signed between the governments of industrialized countries and their counterparts in less-developed countries, if one percent of these promises had been kept, underdevelopment would already have been eliminated. This is not due solely to the conformism of less-developed countries or to the ambivalence of developed countries to the progress of the Third World, although these factors are often present. The lack of efficiency typical of a large part of efforts aimed at providing technical training in non-industrialized countries is a result of planning errors in the management of means of technology transfer.

"You must understand," said Mr Leite, "that the Third World wants all efforts to be concentrated on projects which will enable it to increase its own expertise."

The discussions that followed made it clear that any unilateral development of programs must be avoided, especially if they provide for the research to be done in the industrialized coun-

tries. This will most likely mean that, once again, the main beneficiary will be the industrialized countries. Efforts must also be made to avoid programs whose results are applicable to only a very limited and specific field. When choosing projects, preference must be given to sectors in which the developing countries already have some expertise, thus making possible real participation by both parties, the participants noted.

Will the research and development work now under way in developing countries forestall the future

predicted by French President François Mitterand last year when he said: "I am convinced that the imbalance between the two parts of the world, between the industrialized countries and the rest, will be one of the causes of a major disaster toward the end of this century; in other words, a World War." The question remains unanswered. But at least a real effort was made during the two days on the part of Quebec researchers to promote the exchange and sharing of expertise and experience.

The University of Quebec at Trois Rivières embodies this idea. Its Pulp and Paper Research Centre is already helping to set up small, autonomous paper mills in India and China. And in each of the conference's nine workshops, views were exchanged regarding challenges and objectives in agriculture, health care, new energy sources, forestry, research planning, population and development, education, information, and collaboration among researchers.

If the support Quebec has given to solidarity with the Third World in recent years is any indication of the future, this meeting will no doubt lead to new action and cooperation. The receptiveness that reigned throughout both days was expressed by one of the participants, who said to a colleague during a break: "I think we could learn an awful lot from researchers in Third World countries." □

*The papers presented at the Quebec symposium and a summary of discussion will soon be published by the University of Quebec Press, Quebec, Canada.*



## Science for villages

The appropriate technology movement has come a long way since Schumacher published *Small is beautiful*. From the rhetoric of the late 1960s, it has now become an integral part of the thinking and action of development agencies throughout the world.

As the projects proliferate, however, it is difficult to keep grass roots workers informed of what is happening outside their villages. Keeping these workers in touch is precisely the aim of *Science for villages*, a small magazine of the Centre of Science for Villages, Magan Sangrahalaya, Wardha-442001, (M.S.), India.

Focused on rural technology, the publication contains feature articles, reports of new developments throughout the world and of research results from Indian laboratories, as well as book reviews. *Science for villages* welcomes submissions and new subscribers to help it spread the appropriate technology message.

## Edible tick killers

Two species of South American tropical pasture legumes may not only provide good eating for grazing animals, but could dispatch the hard-shelled ticks that prey on hundreds of millions of cattle and sheep throughout the world.

Reporting in the January 28, 1982 issue of *Nature* magazine, Australian researchers describe how secretions from glandular hairs of *Stylosanthes scabra* and *S. viscosa* plants immobilize and kill tick larvae. Because the insects must climb the grasses to await chance

encounters with their hosts, the scientists assert that the deadly stalks "have the potential to substantially reduce populations of all species of ticks in the extensive tropical and subtropical areas in which *Stylosanthes* can be grown." The use of the legume for tick control is particularly attractive as the usual method — chemical "dipping" of the animals — has begun to produce a super-resistant tick.

Moreover, say the researchers, the Brazilian legumes are frost-resistant and flourish in soils of low fertility.

## Profiting from plant crime

Competition for food has reached murderous proportions in the plant kingdom. With quiet efficiency, beautiful sunflowers, nutritious soybeans, tasty cucumbers, and oil-filled rapeseed (canola) are poisoning their weed neighbours, thereby eliminating them or stunting their growth.

Farmers have long recognized that certain plants don't get along well with others, a phenomenon called allelopathy. Most saw the phenomenon — that also occurs with cereals such as oats, barley, sorghum, and alfalfa — as a problem. But scientists are now working to turn it into an advantage.

Preliminary studies carried out by the U.S. Department of Agriculture have shown that extracts of sunflower plants knocked out 50 to 75 percent of hard-to-control weeds such as johnson grass, ragweed, and wild mustard. They consider that it may be possible to use these allelopathic plants in crop rotation schemes or as mulch to cut weed germination in crop fields.

Using tissue culture techniques to duplicate particularly useful — or murderous — plants, species may be developed that have enhanced weed control toxins. Botanists must, however, overcome the propensity of certain cultivars to lose their disease resistance properties when their allelopathic characteristics are improved.

By combining the use of toxic plants and conventional pesticides, it may be possible to cut food production costs, particularly in developing countries. For more information: Dr Gerald R. Leather, Weed Science Research, Agricultural Research Service, USDA, Frederick, Maryland 21701, U.S.A. (*International Exchange News*).

## Rhizobia for all seasons

Food legumes boast of a high protein content and the ability to survive and produce well in soils with low nitrogen levels. These qualities are determined by the efficiency of nitrogen-fixing bacteria associated with the roots of these crops.

Only the presence of significant numbers of cultivar-specific *rhizobia* in the soil makes the crops self-sufficient in nitrogen. To increase the number of microbes, most developing countries import the *Rhizobium* inoculum, mainly from the U.S.A., Europe, and Australia. But inoculants formulated for use in temperate climates are not always successful when applied on small farms in the tropics.

To increase the efficiency of symbiotic nitrogen fixation, the University of Manitoba (Winnipeg, Canada) has been investigating agricultural environments and their relation to nitrogen fixation. Current work is focused on cold-tolerant *Rhizobium* strains. This work could be of great use in Syria and other countries of the Middle East where it has been found that a staple crop, chick peas, can be sown in winter, with a large increase in yields.

With IDRC support, the University of Manitoba will now work with the International Centre for Agricultural Research in the Dry Areas (ICARDA) to

develop *Rhizobium* carrier systems suitable for production in the Middle East and for use by small farmers. Means of culturing and harvesting the *Rhizobia* will be developed. Technologies for inoculating chick peas with the bacteria will also be tested.

## PANning pesticides

A Pesticide Action Network (PAN) has been established to campaign against the misuses and indiscriminate sale of hazardous chemical pesticides (see *Reports* 10 (3), October 1981). Participating in the network are nongovernmental organizations from 16 countries.

Meeting in Penang, Malaysia, earlier this year, the participants set objectives for the anti-pesticide campaign. They are requesting:

- imposition of export and import controls on hazardous chemical pesticides;
- immediate notification by any government when it bans or restricts a pesticide;
- public release of information on export and import of these products;
- withdrawal of financial support by all international funding and development agencies for any project using dangerous pesticides;
- reversal of the practice by nine international agricultural centres of developing and distributing seed varieties that are heavily dependent on expensive and hazardous chemical pesticides and fertilizers.

PAN will also promote the use of traditional, biological, and integrated pest management schemes. Said one participant: "The alternatives are more effective, cheaper in the long run, and don't kill people." (*Depthnews*)

## Lightweight water storage

Australian engineers have built a prefabricated 4000-litre concrete tank that weighs only one-fifth of conventional concrete tanks.

According to Dr John Meek of the University of Queensland's Department of Civil Engineering, the tank's walls are only 12 mm thick instead of 50 mm. A



lightweight steel mesh reinforcement is used in the tank and there are steel fibres in the concrete mix. The tank's strength is further increased by the shape of its concave walls: pressure from the water contained in the tank forces the concrete in the walls into compression.

The precast walls of the tank fit into slots in the base and the corners are locked together by pouring concrete into cylindrical moulds designed to accept the ends of the panels. All joints are waterproofed with an epoxy compound.

Precasting the lightweight sections results in savings in materials, time, and transport costs. Dr Meek says the tank can be assembled in little more than 30 minutes. The tanks may have a useful application in developing countries in water catchment schemes for villages that rely on rainwater for their supplies.

### **Breeding a better bee**

When they arrived in Latin America a few years ago, African bees received much bad press. Stories abounded about the threat these aggressive bees posed to life and limb, and to the honey industry. In Brazil 80 percent of unskilled and 20 percent of professional beekeepers abandoned their trade. Honey production declined because of excessive swarming of the fast-spreading africanized bees and competition between managed and wild colonies.

Unlike its more docile European counterpart commonly "farmed", the African bee is an aggressive forager and nest defender and is prone to swarming in search of new nectar sources. Researchers now feel that these traits could be harnessed for increased honey production.

To exploit African bees, however, it is necessary to better understand the factors influencing their behaviour and develop management practices and hives that can be used by small beekeepers. These are the aims of a project now being supported by IDRC at the University of Colombia. The

project also seeks to breed and distribute queens of the africanized bee selected for high productivity, ease of management, and low swarming tendency.

Colombia's bee industry presently exploits only 10 percent of the country's potential. Because the africanized bees will require small dispersed apiaries, the research will benefit the country's small-scale beekeepers. The results of the project will also provide much needed information on the management and exploitation of the African bee for Central America and the Caribbean where the bee is expected to arrive between 1983 and 1990.

### **Boosting coconut production**

More than 80 percent of the world's coconuts come from Asia and the Pacific. For many countries of the region, coconut products are the major foreign exchange earner.

But coconut production is dogged by low productivity and price fluctuations in the world market. According to Dr D.L. Umali, representative of the UN Food and Agriculture Organization (FAO), yields are about one-third of what could be obtained.

To improve the lot of coconut palm growers, the FAO and UN Development Programme (UNDP) are launching a project which should put faltering coconut industries on a sounder footing. Based on a regional network approach, the project will pool research, experience, and technical information among participating nations.

"We need to develop the appropriate technology that gives high pay-offs by integrating scientific advances with what has proven useful indigenously," says Dr Umali. The project will thus focus on improving production and management, on collecting germplasm, on intercropping coconuts with other crops, and on farm-level processing. And because coconuts are mainly grown by small-holders, on plantations of less than four hectares, the project will avoid technologies and the

development of varieties that require heavy inputs of chemical fertilizers and pesticides. (TCDC News)

### **Bread: full steam ahead?**

Few foods are as mouth watering as freshly baked bread. But the oven baking that gives bread its golden colour, delicious aroma, and taste could also be robbing it of nutrients.

Dr Cho Tsen of the Kansas State University department of grain science and industry, in cooperation with Egyptian scientist S.K. El-Samahy, tested the effects of traditional baking on the nutritive value of balady bread, a staple food in the Middle East. They found that baking can chemically affect certain amino acids, the building blocks of a protein, in such a way as to make them less available to the body. In bread, the affected amino acid is lysine.

Balady bread, for example, has a protein efficiency ratio of 1.13 if baked for five minutes at 327°C. But this ratio drops to 0.95 if the temperature is increased by 16 degrees. If the bread is baked for 6.4 minutes, the ratio drops to 0.87.

This deterioration emphasizes the importance of controlling temperature and baking time of breads. No similar deterioration has been found when the bread is steamed.

### **Nutrition documentation centre**

Food shortages and dietary deficiencies in the Sahel region of Africa translate into high rates of malnutrition and mortality, particularly in young children. Many studies have been carried out on the nutritional status of these populations, but the results are hard to track down, if not impossible to find.

This lack of information has constrained the activities of the Organization for Research on Food and Nutrition in Africa (ORANA), a Dakar-based agency established in 1956. ORANA's collection of documents is limited to 800 books, most of them old and out-of-date. Only 15 journals are received. Moreover, ORANA's own

publications and reports have not been catalogued or sorted. The researchers themselves have managed the documentation.

To improve this lamentable situation and help ORANA disseminate relevant information throughout the region, IDRC is supporting the establishment of an information centre. The new documentation centre on food and nutrition will collect and classify published and unpublished materials, provide reference services, and distribute materials produced as a result of research projects carried out by ORANA.

### **Remote teaching**

From literacy projects to university courses, from correspondence classes to computer-assisted instruction, from Delhi to Vancouver, distance education is growing rapidly in all parts of the world.

As researchers participating in the June 1982 Learning at a Distance conference held in Vancouver, Canada, point out, this form of education is generally more cost-effective than in-school instruction and enables many people to pursue their education, an opportunity often denied them in the traditional school setting. Given a chance, they say, distance education could contribute significantly to national development, particularly in developing countries.

The researchers are quick to note, however, that the full potential of these forms of education is not being realized. Partly to blame are the lack of research in this field and the inappropriate use of technology. But more important, authorities and individuals often consider distance education to be inferior to traditional methods.

*Learning at a distance: a world perspective* looks at the problems and at means of realizing the potential of distance education. Published by the International Council for Correspondence Education (Athabasca University, 14515-122 Ave., Edmonton, Alberta, Canada T5L 2W4) it contains 118 papers presented at the Vancouver conference.

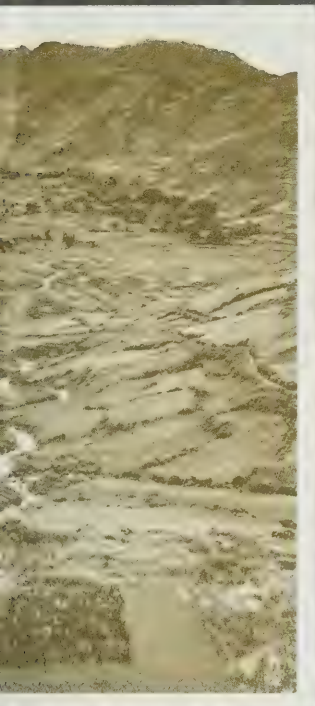




(Left) Rich in oil and protein, the tarwi has important nutritional potential. (Top and middle) Scientists collected and analyzed two million plants in their search for breeding material. (Bottom) The tarwi flower, esteemed for its beauty.







(Left) The tarwi thrives in the rugged Andean environment. Domesticated tarwi (below) and its wild ancestor (bottom); a useful crop for subsistence farmers.



The tarwi is one of many lupines grown in the world for edible seed, green manure, or fodder. Researchers in Peru are developing tarwi's potential as an important food crop for the High Andes.

# HIGH-LIVING BEAN

STELLA DE FEFERBAUM

**T**he tarwi. Domesticated by the forerunners of the Incas and cultivated for centuries, this nutritious legume almost disappeared after the Spanish Conquest. Today, however, it can still be found in the High Andes region of Ecuador, Peru, and Bolivia.

Growing at altitudes of up to 1250 metres where few crops do well, tarwi (*Lupinus mutabilis*) could play an important role in the region. It contains some 20 percent edible oil and up to 40-48 percent protein, both elements that are in short supply in the mountainous regions of Latin America. However, tarwi contains bitter and toxic alkaloids which may account for its near disappearance. Only after lengthy washing is it edible.

Tarwi's nutritional potential spurred Peruvian researchers to begin botanical and breeding work on the plant in the early 1970s. The studies have focused on the evaluation and selection of high-yielding, early maturing varieties, and on the search for sweet, alkaloid-free types suitable

for human consumption and industrial uses.

According to Ing. Oscar Blanco, responsible for lupino research at the University of Cuzco in Peru, by mid-1981 some two million plants had been tested and, while not entirely sweet, low-alkaloid material had been found. Researchers estimate that it will be possible to grow sweet varieties in Peru in some 20 years time.

Farm families who regularly eat tarwi process it for home consumption or buy debittered tarwi in the market. The traditional washing method requires that the seeds be soaked in a stream for 6-8 days until the bitterness has been leached out. This process, however, reduces the seeds' protein content by some 25-30 percent. To solve this problem, an experimental processing plant has been set up and a debittering method developed that reduces this protein loss to less than 10 percent. The alkaloids, once removed and concentrated, can be used for pharmaceutical and other purposes.

Several tests have also been carried out on the uses of the grain. In baking trials, it was found that 20 percent tarwi flour could be substituted for wheat flour, increasing the bread's protein content without affecting quality. Tarwi milk has also been used successfully in the manufacture of candy, cheese, and various snack foods.

The results of this earlier research are now being used as part of a large-scale Andean crops and cropping systems research project being coordinated by the Interamerican Institute of Agricultural Sciences (IICA) in three universities of the high Andes region of Peru. By increasing production and productivity of traditional Andean agricultural systems, the IDRC-supported project aims to raise the living standards of the region's subsistence farmers, most of whom will continue to depend on plant protein for their survival. The research may also help pave the way for tarwi's "comeback" throughout the Andes. □



# TIME AND PATIENCE

BOB STANLEY

## *The keys to new sorghum varieties for Central America*

**C**entral America, the tropical tail of the North American continent, is known for its frequent civil strife and often destructive revolutions. These disruptions are at least in part responsible for the fact that the region as a whole is a major food importer, and that perhaps one-third of its people are malnourished.

Agricultural production is barely succeeding in maintaining even the existing low nutritional levels as the population continues to grow at an annual rate of three percent — threatening to double in just 25 years. But war and rapid population growth are not the only problems here. There is the nature of the land itself, ranging from lush green lowlands to arid rocky highlands. And there is a climate that will drop 200 mm of rain in a week on one area, while another only a few hundred kilometres away faces disaster from drought.

Nothing is likely to change Central America's topography or its climate, but a quiet revolution in agriculture could well help to change the region's dependency on imported grain. Sorghum, a hardy native African grain, first found its way to the Americas some 200 years ago. It met with little interest, however, until the last 20 years or so. Then sorghum production took off.

Today it is second in production only to maize, the traditional staple grain of Latin America. Maize is still number one, and is likely to remain so for some time to come, but the increase in land planted to sorghum is phenomenal. In Mexico, sorghum planting doubled between 1966 and 1976. In Central America during the same 10-year period, Costa Rica's sorghum production tripled, Guatemala's more than doubled, and El Salvador's rose by more than half. In some South American countries — Brazil, Colombia, Peru, and Venezuela, for example — there has been a similar increase in sorghum production.

There are good reasons for growing interest in sorghum in the region. It is a hardy grain that generally withstands poor soil, drought, and other adverse conditions better than maize. It also yields better than maize. But most people still prefer the flavour of maize flour in their tortillas, so sorghum is grown mainly as animal feed, or as an "insurance crop" in case the maize fails.

There is another, more prosaic reason, according to plant breeder Elmer Johnson, of the International Wheat and Maize Improvement Centre (CIMMYT), in Mexico. Sorghum, he points out with a farmer's directness, is harder to pilfer. "Corn (maize) is easy, somebody just breaks off an ear and sticks it in a pocket, and before you know it, in a few days there's half the corn crop walking down the road."

Johnson may well be one of the people responsible for the sorghum boom. He became interested in the crop when he first moved to Mexico in 1958 — and has never lost his interest, even though he was officially working with maize, and had no budget for sorghum research. The varieties available in the early days were from Texas: They were ideal for feed grains and hot climates. What he wanted was a white grain for human consumption that would thrive in the cool of the hills.

In those days, says Johnson, there was no network of international agricultural research centres (see article on page 24). In fact, CIMMYT was not yet an international centre. But Ethiopia was the acknowledged "home" for sorghum, and there were some Ethiopian students studying at the centre who were more than willing to write and ask their families or friends to send them some seed.

The first African varieties had an unfortunate tendency to grow very tall very quickly, and then fall flat before they had time to set seed. But when crossed with more adapted

varieties, they quickly became more productive.

In 1973, IDRC became involved in the sorghum research. It provided a grant for a project with the specific aim of developing a cold-tolerant, drought-resistant sorghum that could be made available to small-scale farmers in highland areas. In 1977, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) also became involved in the project. With its headquarters at Hyderabad, India, ICRISAT is the international centre with special responsibility for sorghum research.

Vartan Guiragossian is a plant breeder with ICRISAT who moved to Mexico at the end of 1977 to carry on the research. Although IDRC's support for the project ended in 1980, ICRISAT's support continues, and grants have been obtained from the Mexican government and from universities in the United States.

Dr Guiragossian believes that the work done in the 20-odd years since Elmer Johnson began his "hobby" amounts to a major breakthrough. The first requirement has been met: to diversify the cold-tolerant genotypes to produce a stable fertile variety that the farmer can keep and plant year after year.

Dr Guiragossian has built a frame house covered with black plastic sheeting that can be rolled back to artificially create "days" of any length. By segregating plants using this method, varieties least sensitive to day length are selected. Every single plant is bagged to ensure that it really is fertile, and not randomly fertilized from outside.

The resulting white-seeded varieties, says Guiragossian, yield three to seven tonnes of grain per hectare, and are suitable for making tortillas and other local flatbreads. He has produced hundreds of tortillas in cooperation with the National Institute of Agricultural Research (INIA) in Mexico, using dozens of different combinations of sorghum and maize flours. They are evaluated for everything from taste and texture to colour and consistency. He has already published information on how to identify sorghum types suitable for tortilla making.

There is still more research to be done, however, before Guiragossian will be satisfied that he has the "right" sorghum for the highland farmers. He is now identifying varieties with higher protein content and less tannin and phenol content, coupled with acceptable taste. High tannin and phenol content darkens the colour and makes the protein unavailable for monogastrics (one-stomach species like ourselves). These problems can be overcome, he says, and meanwhile the new varieties are undergoing farm trials in Mexico and Guatemala. There is also interest from Bolivia, Colombia, Ecuador, and Peru. Young researchers from many developing countries are receiving training at CIMMYT as part of the program.

Guiragossian foresees the day when two million hectares of highland farmland in Latin America will be planted to the new sorghums, broadening the farmers' cropping options, and giving them added insurance against drought.

Elmer Johnson is even more of a believer. He says that sorghum is replacing maize in Central America — because it is more drought tolerant, and on average yields twice as much grain. It is just a matter of breeding the right type of sorghum, he says. "Improving a plant is like filling a truck with sand — one shovelful at a time. All it takes is time and patience." □

*Vartan Guiragossian examines sorghums in his breeding program: high yields and good cooking qualities make it a strong rival to maize.*







*For the first time, a complete vertical section of the ocean floor is being obtained*

**M**ay in Cyprus. In a river canyon in the southwest of the country, two geologists and some 20 scientists from a number of developing countries, Europe, and North America are disputing just how this bit of the Earth's crust, conveniently sliced open by centuries of running water, has been constructed. Downstream, on the banks of the river, a drill rig is biting down through the rocks. Hazy in the distance, the jagged summits of the Troodos massif, 3000 square kilometres of rock, are visible.

The fascination with the rocks of Troodos is with their origins. They came from the virtually inaccessible three-quarters of the Earth that lie beneath the sea.

The Cyprus expedition was organized by the International Crustal Research Drilling Group (ICRDG), an informal network of earth scientists all of whom have been — as one of its founders, Dr Jim Hall of Dalhousie University, Halifax, Canada — puts it, “bitten by the bug of the ocean floor.” During the past decade they have set out in ships to dredge and drill rock samples from the ocean floor and have mounted drill rigs on islands such as Bermuda, the Azores, and Iceland. Their latest project is to sample a four-kilometre-deep sequence of ocean crust thrown on land in Cyprus.

Some of the funding for this work comes from IDRC and enables geologists from the Geological Surveys of a number of developing countries to join the project as trainees and collaborators. The first group of trainees were in Cyprus in May: Nick Baglow from Zimbabwe, Hassan Haroun from the Sudan, Miguel Haller from Argentina, Kewal Sarin from India, and Ibrahim Shalaby from Egypt.

During their eight weeks in Cyprus these trainees shared rooms and chores with the ICRDG scientists at the project headquarters, a mining company bunkhouse in a village near Nicosia. Here, they exchanged information about field work in other parts of the world.

For Third World geoscientists, whose work usually entails general mapping and mineral prospecting, the Cyprus project is a welcome chance to study fresh rocks in the kind of detail to which only a large team of specialists, pooling their knowledge and their elaborate analytical tools, can aspire. The rock cores obtained in Cyprus, for instance, will be analyzed using a X-ray fluoroscope, which at U.S. \$250 000 is a prohibitively expensive tool for most developing countries.

In the Third World, scientists tend to be isolated from their fellows. The Cyprus project provides them with an opportunity to make stimulating and fruitful ties. Through practical experience and interactions with visiting scientists, they are being exposed to state-of-the-art knowledge and

interpretation of important areas of ocean crust geology, hydrogeology, and drilling technology. Ibrahim Shalaby, chief of the Geological Survey of Egypt, says: “This is a chance to meet the experts. I already know them by name, from reading their papers. This experience will help modernize geology in my country.” The high speed diamond drilling method and equipment used, for example, has been brought in from the mining fields of northern Quebec where the technology has been developed to its peak in support of the Canadian metal mining industry.

The countries from which the trainees were invited all have geological affinities with Cyprus. Some have shortages of water: There is a dam or a pump in every river in Cyprus; its groundwater has been exhausted; the lakes, coloured blue on its maps, are mostly dry. Some have similar mineral resources: the word “Cyprus” is synonymous with “copper”; the island is dotted with the black heaps of slag left when metal for the spears, helmets, and chariots used by Homeric warriors was smelted. Aside from such affinities, the Cyprus project is interesting because it is expected to produce significant new evidence regarding the nature of and processes associated with ocean crust formation.

In the 1950s geologists knew the ocean basins were deep and floored with heavy rock . . . and that was about all. Any answers to questions such as how the sea floors had formed had to be conjectural, for between geologist and geology lay an oceanic barrier, several kilometres deep. Then came the revolution. The theory of plate tectonics did for the earth sciences what relativity did for physics or what the double helix did for biology; it tersely and compellingly explained a wealth of observations. Continents and oceans once thought of as fixed, were now seen to ride the rigid slabs into which the Earth's outermost shell was broken. Where they collide, the crust crumples and mountains rise. Ocean floor, according to the new theory, is formed as mol-

## EXPLORERS OF THE OCEAN FLOOR

SEAN McCUTCHEON

*Miguel Haller examines a sample of the Troodos massif. (Inset) Dr Jim Hall and one of the drill crew with a core: a piece of the ocean floor.*





## *The Troodos massif yields new scientific information with practical applications*

ten lava rises to fill the gaping fissures left as two plates move apart from one another. Welded to the trailing edge of the departing plates, new rock begins a slow journey away from its place of birth.

If this theory is correct, what should one see as one drills through the rocks of the ocean floor? At the top, a thin layer of sediments. Below, the pillow lavas whose rounded shapes declare these once-molten rocks to have been erupted underwater and then rapidly chilled. Below again, the sheeted dykes — fine-grained slices of lava which never reached water but froze in the fissures of a spreading seafloor. Next, greenish, coarse-grained gabbro, a crystal mush coughed up from deep below, which slowly hardened deep in the outer envelope of our planet. And, lying still deeper, the residue left in the Earth's bowels from which molten magma has been vomited to the surface.

Just this combination of rock types has been observed in many parts of the world. Because of their green-grey, mottled appearance, geologists named the heavy rocks at the bottom of the series "ophiolites", from the Greek for "snake-like", and then extended the term to signify the combination. But why lavas, gabbros, and so on should be found together no one could explain. According to Ian Gass, one of the ICDRG's principal scientists, no one even tried to explain it: "The nineteenth century geologists," he says, "would draw a line around anything green and dirty

and altered, call it an ophiolite, and walk away."

Ophiolites are now recognized to be fragments of the floor of long-gone oceans somehow marooned on land. They attract geologists who wish to study the ocean floor without incurring the enormous technical difficulties and expense of probing beneath the ocean with submersibles or drill ships. In most ophiolites the junctions between constituent types of rocks, so significant for geologists, have been blurred or erased. Cyprus' ophiolite, the Troodos massif, is unusually well-preserved. Representatives of all the rock types, exposed by road cuts or rivers, are visible on this island. Now, for the first time, a complete vertical section — a sample showing all these rock types in sequence — is being obtained.

This drilling project will produce more than pure scientific information. It might suggest underground sources of water for parched Cyprus, or, by revealing more about how hot springs on the ocean floor deposited copper and other minerals, lead to new mineral exploration techniques.

And, as a result of the training, developing-country geologists and engineers will have an opportunity to apply the new scientific information obtained to resource development activities in their respective countries. □

*Sean McCutcheon, a Montreal-based science writer, visited the site of the Cyprus crustal study earlier this year.*



### **THE PROJECT**

The Cyprus Crustal Study project is a collaborative research effort between Dalhousie University (Canada) and the Cyprus Geological Survey. It is the first venture supported by IDRC's Cooperative Programs Unit in the area of earth sciences, and specifically into resource assessments.

The fourth study to be carried out by the International Crustal Research Drilling Group (ICRDG), the overall project is financed by a number of countries and institutions, for a total of more than Cdn \$1.6 million. The ICDRG itself has some 50 members drawn from universities, geological surveys, and energy departments of eight countries.

By producing significant new evidence on the formation and evolution of the oceanic crust and information of importance for resource assessment, the investigation will greatly benefit the Geological Survey of Cyprus. But because a number of developing countries have regions with strong geological similarity to the Troodos area, the results will assist them in the identification of copper ore deposits, sources of geothermal energy, and groundwater resources.

# PESTS OF A FEATHER

ASOKA YAPA

## BIRD PESTS IN DEVELOPING COUNTRIES

**C**harlis Appuhamy cultivates four hectares of rice in Ratmale, a village in northcentral Sri Lanka. Although Charlis' family grows a variety of vegetables around its modest home, it depends on a good rice crop for its prosperity.

It is close to harvest time now and the stalks of rice, heavy with grain, glint golden in the morning light as Charlis approaches the fields. A small flock of *vee kurullo* (paddy birds), startled from their gorging on the rice, takes to the air. Further on, a green cloud of rose-ringed parakeets rises squawking and screaming at the interruption of their breakfast.

For Charlis, there appears to be no practical way to keep these birds from eating into the family's livelihood, as he does not have the resources to constantly watch over the fields. So he accepts their depredations with a mixture of frustration and stoic fatalism; indeed, when sowing the seed paddy he even scatters a goodly portion "just for the birds."

Bird pests are a problem to agriculture throughout the developing world. In tropical Asia, flocks of rose-ringed parakeets, munias, weavers, Java sparrows, and doves such as *Streptopelia chinensis* attack fields of rice, sorghum, millet, and maize. Farmers in Latin America have to contend with *Aratinga* parakeets, dickcissels, and eared doves. But it is in Africa, where extensive grasslands have favoured the evolution of seed-eating birds, that vast hordes of weavers, whydahs, sparrows, and particularly queleas, pose the most serious threat.

Migratory flocks of queleas can number more than a million birds, and communal night roosts often hold several million individuals. Golden sparrows in the Sahel, and Ruppel's weavers along the Red Sea coast, are other species sometimes observed in huge concentrations. Although other African grain-eating birds rarely congregate in such large numbers, mixed flocks of hundreds of thousands are common.

Avian pests throughout the world are superbly adapted to a grain-eating way of life. Large, broad, and powerful bills, and well-developed jaw muscles to power them, enable the birds to husk seeds quickly and efficiently. Large beaks increase the size range of seeds that can be exploited, allowing a quelea, for example, to feed on large grains of rice as well as its normal natural food of small grass seeds. Strong jaw muscles will enable a bird to eat even hard cereal grains. Such versatility is essential to the success of opportunist food gatherers.

Feeding in huge flocks is a highly competitive business and an expandable oesophagus enables the bird to gorge itself with sufficient food for the day during a short feeding period. It is also an advantage when the bird is dependent on a patchily distributed food supply. Feeding on whatever seed is available, and migrating to find new food-gathering areas, also increases the birds' feeding efficiency.

Successful granivores had evolved some or all of these traits well before humans developed agriculture. So, when technical improvements like irrigation increased both the yield of cereals and the reliability of the resource, native grain-eating birds were ready to exploit the bonanza.

Nevertheless, only a handful of bird species have become major pests. But because they feed during the day and are so conspicuous, birds are often blamed for all damage, even that caused by rodents and insects. Indeed, there is no evidence to suggest that bird pests seek out agricultural produce. They eat cereal grains only if they are lucky enough to chance upon ripening fields.

If, globally, the damage caused by birds is small compared to insect and disease ravages, locally, they can spell catastrophe to small farmers. After a major quelea attack on a rice farm at the Chad-Cameroon border, for example, crop losses averaged between 13 and 26 percent of the estimated yield. Some plots reported a loss of 86 percent. These

*Bandits on wings  
steal or damage  
millions of tonnes of  
grain annually  
throughout the  
developing world.  
Dislodging the bird  
pests from their  
ecological niche has  
proven very difficult*





(Top) The ravaging quelea, a superbly evolved devourer of grain. (Left) Scaring birds in Senegal: the most persistent wins the crop.

figures are typical of a crop raid by birds: Some fields will be nearly devastated, while neighbouring plots are left untouched. Often farmers will be so discouraged that the crop is simply abandoned.

A multidisciplinary pest management study team, commissioned by the U.S. Agency for International Development (USAID) in the early 1970s, estimated that annual devastation ranged from millions of dollars of losses of food crops in the Sudan to complete losses in certain valleys of Senegal. The researchers concluded that bird depredation is the most serious plant protection problem in the African savannah. Crop losses intensify a food crisis already created by drought and a general lack of available food.

Control strategies have been largely unsuccessful. Traditional methods usually rely on scaring birds. However, scarecrows of various types serve only to lull human caretakers into complacency. The birds soon get used to such devices. Active human guards armed with noisemakers can protect small

fields quite well, but often end up merely deflecting the birds to neighbouring crop stands.

Large-scale population reduction has been attempted in many developing countries by massive application of powerful avicides. But these have largely proven to be expensive exercises in futility. Worse, they pose potential dangers to human health. One popular means of destroying bird pests is to spray them with potent skin-penetrating organophosphorous poisons. Large amounts of these persistent chemicals are sprayed from helicopters or light airplanes. Not only is the present chemical control costly and environmentally unacceptable, but in most cases it is not making a major impact on bird populations.

Considering that breeding colonies of quelea in southern Africa can lie anywhere within a six million km<sup>2</sup> zone, the impossibility of proper control, for economic, logistical, and political reasons becomes obvious. At any rate, it is extremely likely that another granivore would simply take the place of quelea

the moment that biological niche opened up.

The wisest course is to avoid these powerful poisons altogether and look for alternative means of reducing crop loss.

Making the plant tolerant to bird attack is an approach scientists at the International Crops Research Institute for the Semi-Arid Tropics in Hyderabad, India, are using with sorghum. Their aim is to select strains with seed types less desirable to birds. Some rice varieties also have flag leaves above the normal leaf canopy that act as "scarecrows," reducing bird damage. But plant breeders cannot combine all the most desirable characteristics in a single strain, and bird resistance may be paid for by decreased yields or longer growing times.

One promising technique is the alteration of cropping patterns. The principle is prevention rather than a drastic cure: If crops are made to mature — and are reaped — before the migratory birds come around, crop loss would be minimized. Experiments performed in West Africa have proven the effectiveness of this method. At the same farm in Cameroon cited earlier, crop loss was reduced to one percent.

But the technique is not without its problems. It is difficult to alter crop maturation times. This usually necessitates a genetic reprogramming of the crop — a costly, time-consuming exercise. Also, locally resident birds will feed on crops whenever they become available. Imponderables such as variations in climate and unusual movements of birds can spell disaster in such a finely tuned system. Nevertheless, alteration of cropping systems appears to be the most effective and least destructive method so far devised to prevent crop losses to bird pests.

The USAID pest management study team recommended that highest priority be given to developing appropriate control mechanisms for bird pests. Yet no satisfactory methods have been developed to date. "Multilateral programs of research and education represent the only reasonable approach to the development of an effective program", say the researchers. And as Dr G.E. Guyer, a member of the team pointed out, until bird depredation is brought under control, the effectiveness of many of the programs associated with the "green revolution" to increase crop production will suffer.

Charlis Appuhamy and his fellow farmers throughout the developing world would certainly welcome the development of effective techniques to rid their fields of *vee kurullo* and other bird pests. That these techniques be environmentally safe and pave the way to increased food production would be a bonus for everyone. □

Asoka Yapa is a science editor working in Ottawa, Canada



# LEARNING FOR PROGRESS

## EDUCATION IN DEVELOPMENT

J. KING GORDON



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*The Bellagio Conference on financing education held at Mont Sainte Marie, Canada*

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**T**he main building in the Mont Sainte Marie resort is set on the bottom of a cup of green hills in the province of Quebec in Canada. If you are looking for a view or wish to locate yourself on the map of the Gatineau Hills, you will have to climb a little mountain or at least follow the winding path that takes you down toward the lake. One trouble with the Bellagio conference held there in May 1982 was that there was no time to do either.

The conference was called to examine the financing of education for development in Third World countries. The majority of participants were senior staff members of so-called "donor agencies." One conclusion that emerged after two-and-a-half days' talk was how impossible it was to tackle such an issue without taking into account the drastic changes that had occurred in the global system.

The group that met this year traces its origins to a similar inter-agency group that gathered from time to time at an ancient castle set in the mountainous lake country of northern Italy known as Bellagio. The Rockefeller Foundation had converted it into an exclusive, but functional, conference and study centre. Here donor agency representatives, sometimes at the highest level, could meet for informal discussions of target problems, to the solution of which

their assistance was directed. Frequently, the topic concerned education — literacy, primary education, adult, and non-formal education. Policies were discussed to bring about greater coordination of effort and to avoid duplication, conserve resources, and enlarge the impact of education through improved modern communications. And in between Bellagio meetings, senior staff from agencies met to examine in greater detail special aspects of problems affecting the objectives or the mechanisms of development support. The financing of education was one such problem.

A good deal of preparation had gone into the planning of this year's conference. Researchers and consultants from the School of Education of Stanford University, the Faculty of Education and the Institute of Development Studies of the University of Sussex, as well as from IDRC and the Canadian International Development Agency (CIDA), had been asked to prepare papers under such titles as "World trends and prospects for educational costs and expenditures", "The political economy of financing education in developing countries", "Adjusting to the 1980s — taking stock of educational expenditure", and "A review of educational innovations to reduce costs". Powerful academic erudition, which at times left

the uninitiated — and even the practical program director of an international agency — in a mild state of shock! But there were many realistic analyses, which sometimes contributed more than was intended — a persistent assumption that education was the "handmaiden" of the West's great contribution to the developing countries in the shape of modern science and technology, the close tie between education and increased income, the tendency of educational development to concentrate in the urban sector to the neglect of the rural, the status significance of education, the concern of donor agencies that their support of education be cost effective in terms of economic development.

This was one side of the picture. The other side was revealed in an IDRC research paper on educational innovation as a factor in cost reduction. Certain innovations, such as the use of radio and video communication systems to reach a larger learning constituency saved on the costs of buildings and teachers. The innovations, in general, could also stand on their own as representative of new and relevant ideas emerging from a fresh assessment by the authorities in a developing country of the educational needs of their people. And notable, in case after case, was a shift in emphasis from the



inspired and beneficent wisdom of the donor to the basic realism of the country and the people of the country who are primarily responsible for achieving a measure of good life for their people. Conference participants were reminded of where the real responsibility rested by the authors of one paper, who produced the interesting statistic that contributions from all outside sources accounted for only nine percent of the total funding of education in countries of the Third World.

One important change in educational emphasis that became increasingly evident in the later 1970s was a new recognition of the claims of the formerly neglected rural sector. The achievement of a measure of economic growth in the urban industrial areas, fed to some extent by an infusion of western technology and capital investment, did little if anything to alleviate the dire poverty of the people on the farms and in the villages. Education tended to be focused on the population of the cities as an adjunct to economic advancement. The decision to adopt a more equitable distribution of educational opportunities was much more than a conversion to a more enlightened approach to the claims of human rights. There were political and economic factors as well — a mounting resentment against a power structure that served the interests of one class to the neglect of others, and an increasing recognition that the urgent need for increased food production meant new concern for the agricultural community and its proficiency in the production of food.

This movement of educational focus from town to country was reported in the papers before the conference, but was also evident in the firsthand information from national and international agencies providing support for new initiatives in developing countries. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) reported new demands for support for literacy programs and for the development of primary education. The International Labour Organization (ILO) appeared to be moving away from the large vocational training schools linked closely to industrial development to self-teaching instruction modules and on-the-job training with a heavy emphasis on rural occupations. The World Health Organization (WHO) was placing an increasing emphasis on meeting the training needs of rapidly advancing primary health care programs with a focus on improvement of conditions of sanitation, fresh water, food production, and nutrition at the village level. Closely associated with such developments is a concern for various manifestations of non-formal and adult education, not as an alternative to formal education, but as an essential complementary educational activity.

If it were true that the main responsibility for educational development in the Third World rests with the governments and educational authorities in developing countries, then it would

seem to follow that one of the main contributions of donor agencies must be to strengthen the capability of those governments and authorities to direct that development in the most effective way to meet the needs of their people. Here, perhaps, IDRC sets an example in its support of research in and by developing countries so as to help in building up their scientific and technological capacity. Its more recent emphasis on training programs closely linked to research projects as well as its encouragement of cooperative research between Canadian and Third World universities and research institutions is a natural progression. In the development program under the Netherlands Universities Foundation for International Cooperation (NUFFIC), educational support is moving out from specialized scientific institutes in the Netherlands into project and program cooperation in Third World countries. In Sweden, The Swedish Agency for Research Cooperation with Developing Countries (SAREC) is following IDRC's example with emphasis on cooperation with international agencies.

At the Mont Sainte Marie conference were a number of delegates from Third World countries. Some were invited in their own right as distinguished educators. But interestingly enough, the voice of the Third World was heard more often in the presentations and interventions of the representatives of international agencies — the World Bank, UNICEF, the Inter-American Bank — institutions normally considered as expressing the developed-country point of view. It was they who insisted with greatest force that the traditional donor-recipient relationship, frequently linked with a resultant Third World dependency, was now outmoded. Support from developed countries and from international institutions was needed more than ever. But it had to be on the basis of cooperation among equals.

There had been a good deal of evidence that this transformation was taking place. While the well-documented

tradition of the political goals of aid was still demonstrated in ongoing policy, there were other examples of belief in the mutual goals of cooperation as set forth in the Brandt Report. In the field of educational support, the cooperative initiatives of nongovernmental organizations in a wide range of activities were highly important. And universities in developed and developing countries were demonstrating in a more effective way their time-honoured role as a community of scholars with little regard for national boundaries. The British and the Dutch have been pioneers in this inter-university linkage. Now Canadian universities, through their International Development Office and with support from CIDA's Institutional Cooperation and Development Services Division and IDRC's Cooperative Programs Unit are becoming an important part of this new mode of international cooperation in education.

The international situation has changed: The role of national and international agencies has changed since the Bellagio Group came into existence more than a decade ago. In the final hours of the conference the question was raised: Should it continue? It had been a useful experience for all — and not just in the formal discussions. Perhaps what was needed was a careful assessment — not merely of the question of keeping the group in existence, but of the more basic question of what constructive new directions might be set. An ad hoc committee was chosen to give these matters serious thought.

It is possible that they may have an opportunity to climb a little mountain to get a view of the global landscape and follow the winding path down to the valley where the people live. □

*J. King Gordon, former IDRC Special Advisor to the President, University Relations, was conference consultant, education for development, for the Canadian International Development Agency. The proceedings of the conference will be published by IDRC later this year.*



*Schools in the Philippines (opposite) and Senegal (above): accent on rural education.*



## THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

**T**he outlook for world food supplies was bleak in the 1960s. Concerned scientists saw the spectre of mass starvation loom behind the statistics on rapid population growth and sluggish food production.

Most of the world's arable land was under the plow. Expanding onto less suitable and marginal lands involved greater risks, expensive improvements, and more demanding management than was within the reach of farmers in developing countries where food was most urgently needed.

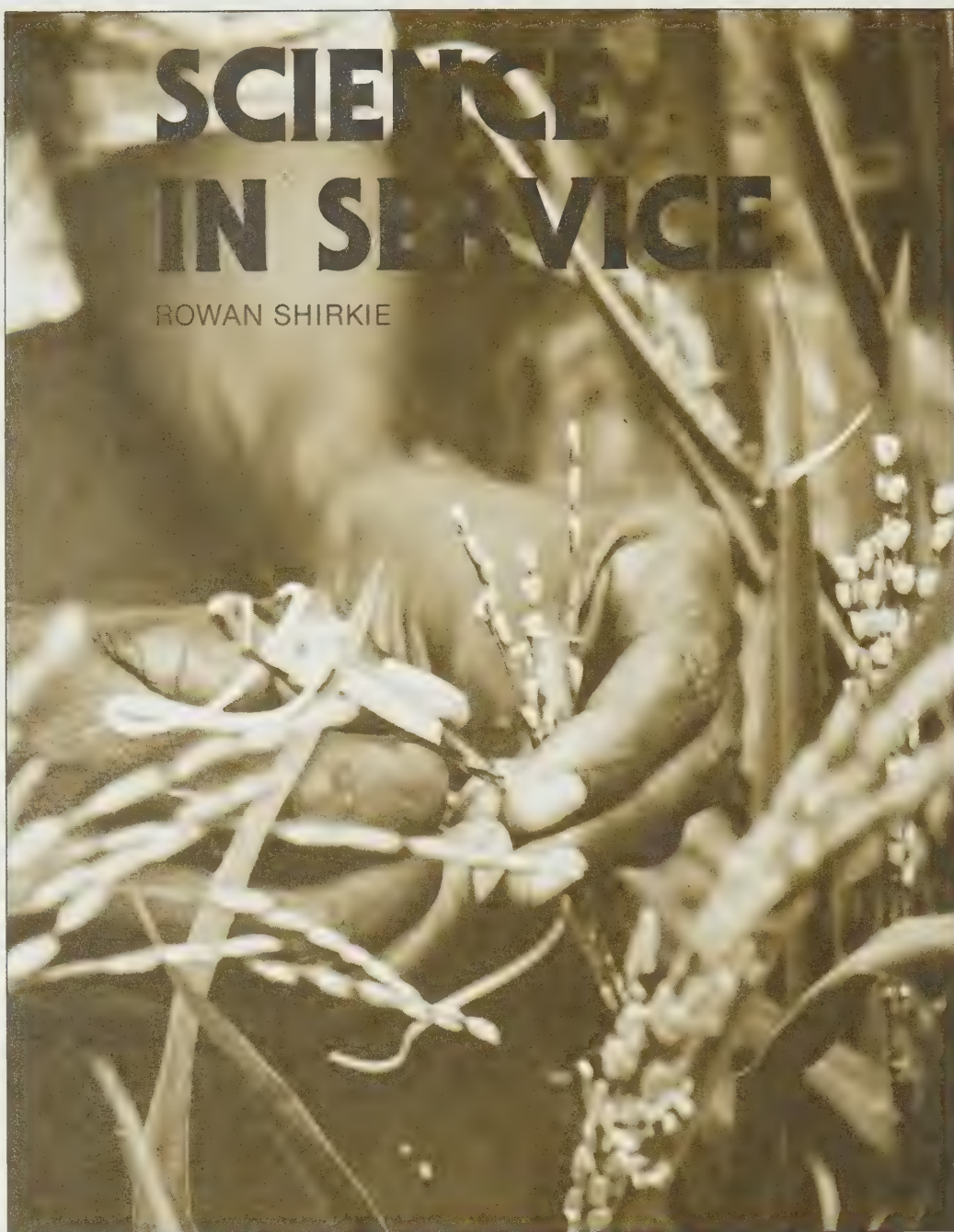
Intensifying production on existing lands appeared to be the only solution, and the application of improved agricultural techniques the means to achieving it. Thus in 1971, the Consultative Group on International Agricultural Research (CGIAR), an informal consortium of governments, international and regional organizations, and private foundations, was established to nurture agricultural research for the benefit of developing countries.

The CGIAR and the network of international agricultural research centres it supports evolved from a crop improvement program of the government of Mexico and the Rockefeller Foundation begun in 1941. The research then was on high yielding "dwarf" wheats: heads heavy with grain on short stiff straw strong enough to support the increases. In 1959, the Rockefeller and Ford Foundations joined together to apply the same approach to rice in Asia, and in 1962 set up the International Rice Research Institute (IRRI) in the Philippines to accomplish the task. The seeds of change had been sown.

By 1978, some 25 million

# SCIENCE IN SERVICE

ROWAN SHIRKIE





hectares — about one-quarter of all Asia's ricelands — were sown to the IRRI dwarf rices. Mexican wheats grew on about 29 million hectares around the world and, between them, the new higher yielding varieties were estimated to be feeding about 300 million people.

But the payoffs from agricultural research were making themselves evident before 1978, and in the late 1960s the Mexican wheat program was restructured as the International Wheat and Maize Improvement Centre (CIMMYT) and two more international centres were established. Global support grew for the concept of expanding the system of international research centres to include additional food crops and farming systems important to other regions of the developing world. This support was given expression in 1971, when the World Bank, the Food and Agriculture Organization of the United Nations (FAO), and the United Nations Development Programme (UNDP) jointly sponsored the creation of CGIAR.

More like a philanthropic club than an international research bureaucracy, the CGIAR has grown from a core of 15 donors contributing \$12 million to four centres in 1972, the first year of operations, to the present 35 donors contributing \$149 million toward the support of 13 research centres (see box next page).

The Group is a unique "non-institution." It operates without a legal charter, or codified rules, but with the common consent of members that their purpose is to consult and agree on ways and means of supporting international agricultural research. Meetings are held once or twice a year to consider program and budget proposals of the international centres in the network. Decisions are by consensus, and the actual allocation of funds is made mainly on a voluntary basis between individual donor members and recipient centres.

The group has an independent Technical Advisory Committee (TAC) with its secretariat hosted by the FAO in Rome, that reviews scientific and technical content of centre programs and recommends research priorities. An administrative secretariat is maintained for the group by the World Bank, which also provides someone to chair the group.

The idea behind the CGIAR and the international centres that it supports was to concentrate on agricultural research and allocate resources more effectively. A network of autonomous, independent research Centres, free from the pressures of governmental policies, was created. The original function of the CGIAR was to review the needs for international agricultural research and the means of meeting them. The group sought to work in harmony with national and international research programs, and to encourage exchange of information.

As the system evolved, it became clear that the new technologies needed to be adapted and applied to specific needs and particular environmental conditions. Thus, strengthening the capacities of national and regional programs to appropriate and use new technologies gained importance.

As it enters its second decade, the CGIAR looks back to the conservation and exploitation of genetic resources as prime among the contributions the system has made to agricultural research. More than half of the Centres' work has been in the area of breeding and improving varieties of food and pasture crops. By drawing on banks of genetic materials carefully gathered and stored as the raw materials for research, the centres have been able to produce crops with higher potential yields, and greater resistance to disease, drought, and pests. They also do all of it in a more reliable way to assure a reasonable harvest and better income for farmers who grow them.

The original wheats and rices that were the basis of increased yields in Asia are the most notable successes. Now, new generations or irrigated rice varieties, developed for Latin America by IRRI and the International Centre for Tropical Agriculture (CIAT), are increasing yields by 50 percent in 20 countries of the region. And new cassava cultivars developed by CIAT and the International Institute of Tropical Agriculture (IITA) give better yields and resist the major mosaic and bacterial wilt diseases that used to rob African farmers of their harvests. A special centre, the International Board for Plant Genetic Resources (IBPGR), protects the genetic heritage and resource for future crop improvement programs by encouraging and coordinating the collection, mainten-

ance, and distribution of plant materials throughout the world.

Beyond the plants themselves, the CGIAR's work on farming systems and the components of increased productivity has been substantial. Recognizing the need to reduce dependence on purchased inputs such as fertilizer, member centres have developed farming systems to aid farmers working with limited financial, climatic, or soil resources.

Systems using soil, water, and crop strategies to overcome limitations or boost production under difficult conditions have been established for rice and other important food crops. Almost two-thirds of the recent research at IRRI is now directed toward improving methods of growing rice under rainfed conditions, as opposed to the traditional irrigation, expanding the potential of this vital foodstuff onto upland areas. In the same way, work at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) seeks to develop sorghum and millet varieties that are able to maintain high yields without large doses of nitrogen fertilizer.

The first five-year review of CGIAR activities estimated that, by 1978, over one-third of the land planted to rice and wheat in developing countries had been sown with the new varieties developed by the international centres. Production of wheat and rice had increased significantly, as had, to a lesser degree, maize, sorghum, millet, and other coarse grains to which centre research had turned. Compared to the traditional varieties, the new technologies yielded 40 percent more rice and 100 percent more wheat than the traditional crops they had replaced — in all, a production increase valued at \$3-4 billion annually by 1978.



*International agricultural research: improving, adapting, developing new crops and farming systems for developing countries. (Opposite page, top) Preparing rice for breeding in Sri Lanka; (opposite page, bottom) intercropping rice and sweet potato to intensify food production; (left) adapting wheat to Ethiopia's higher, cooler conditions.*



Amid the successes, there are also goals not met. The goal of increasing the productivity of individual food crops and cropping systems is an ongoing one for the Group. It is concerned that more of the improved technologies must be adapted to reach the many resource-poor farmers who did not benefit from the first generation of high yielding varieties.

For the future, the system members foresee a tighter focus on research on food crops and cropping patterns of importance to poorer farmers who still labour largely outside the established production and marketing networks. Millet, lentils, and other pulse crops, as well as yams and cassava, are grown in complex cropping patterns. And when animal or tree crops are added, and the whole divided into the millions of small-holdings in the developing world where production gains are urgently needed, it is apparent that the next decade's work presents no less of a challenge than the first.

Strong programs to exploit genetic resources will continue. New varieties "still represent the most easily transferable technology at the farmer level", according to the review committee examining the Group's past and plotting its future course. There is still great scope for raising and stabilizing production through plants that are more productive, more resistant to disease and pests, and more responsive to improved management, and those — particularly legumes — that use symbiotic organisms in the soil to fix nitrogen from the air.

New activities are also planned as part of an integrated approach to agricultural research. When additional funds are available, water management — particularly of irrigation water — will be given more priority, as will the problems related to energy use, and the development of implements for use in small-scale mechanization. Throughout the programs, the CGIAR members will continue to attach great importance to training activities. And the creation in 1980 of the International Service for National Agricultural Research (ISNAR) is intended to provide a mechanism for strengthening the capabilities of developing countries themselves to plan and carry out agricultural research and development, and to participate more fully in international programs.

Inflation, tight money, a general questioning of strategies and modes of operation also lie in the future for the CGIAR, as they do for other international organizations. And its greater task — to help bring about the four percent annual increase in agricultural production that will be necessary to feed the world through to the year 2000 — takes on increasing urgency. Fortunately, in a way that few other organizations can claim to be, the CGIAR and the international Centres appear equal to the challenges. □

## *The global network of international research centres*

# THE CGIAR CONSTITUENCY

**Centro Internacional de Agricultura Tropical** (International Centre for Tropical Agriculture) (CIAT), Cali, Colombia, established 1967:

- primary concern the welfare of poor urban and rural peoples of the tropics of the Western Hemisphere;
- focus on beans, cassava, tropical pasture crops, and rice.

**Centro Internacional de la Papa** (International Potato Centre) (CIP), Lima, Peru, established 1971:

- primary concern to develop improved potatoes for high-altitude temperate and lower tropical regions.

**Centro Internacional de Mejoramiento de Maiz y Trigo** (International Wheat and Maize Improvement Centre) (CIMMYT), Mexico, Mexico, established 1943, expanded into international centre 1966:

- primary concern the improvement of maize, wheat, barley, and triticale.

**International Board for Plant Genetic Resources** (IBPGR), Rome, Italy, established 1974:

- primary concern the collection, conservation, documentation, and use of plant germplasm.

**International Centre for Agricultural Research in the Dry Areas** (ICARDA), Aleppo, Syria, established 1976:

- primary concern rainfed agriculture in arid and semi-arid regions of North Africa and West Asia;
- focus on barley, lentils, fababean, and forages: regional focus on wheat and chickpea.

**International Crops Research Institute for the Semi-Arid Tropics** (ICRISAT), Andhra Pradesh, India, established 1972, the first of the international centres created in the CGIAR system:

- primary concern the improvement of quantity and quality of food production in the semi-arid tropics, soil and water management;
- focus on sorghum, pearl millet, chickpea and pigeonpea, groundnut.

**International Food Policy Research Institute** (IFPRI), Washington, U.S.A., established 1975:

- primary concern to identify food policy issues; to collect, organize, and analyze information relevant to social, economic, and agricultural research; and to suggest policy alternatives.

**International Institute of Tropical Agriculture** (IITA), Ibadan, Nigeria, established 1967:

- primary concern food production in the humid and subhumid tropics, traditional farming systems;
- focus on cowpea, cocoyam, and sweet potato;
- regional focus in Africa on cassava, rice, maize, soybean, lima bean, winged bean, pigeonpea.

**International Laboratory for Research on Animal Diseases** (ILRAD), Nairobi, Kenya, established 1974:

- primary concern to develop effective controls for two major diseases of livestock in the tropics, trypanosomiasis and theileriosis.

**International Livestock Centre for Africa** (ILCA), Addis Ababa, Ethiopia, established 1974:

- primary concern the improvement of African livestock production and marketing systems, training of livestock specialists, and documentation.

**International Rice Research Institute** (IRRI), Manila, Philippines, established 1960, the first international centre for agricultural research and the prototype for succeeding centres:

- primary concern rice improvement and related farming systems.

**International Service for National Agricultural Research** (ISNAR), The Hague, Netherlands, established 1980:

- primary concern is the improvement of critical institutional elements;
- provides assistance to national programs in planning and executing research and development.

**West Africa Rice Development Association** (WARDA), Monrovia, Liberia, established 1971:

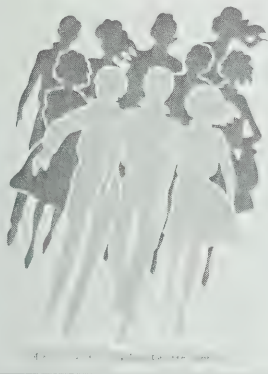
- primary concern to promote self-sufficiency in rice in West Africa through development of improved varieties and appropriate farming systems.



**Eight years of their lives: through schooling to the labour market in Chile**, by Ernesto Schiefelbein and Joseph P. Farrell. Published in August 1982, 207 pages, IDRC-191e.

The results of the first large-scale longitudinal study of an educational system in a developing country are presented. Researchers followed a cohort of about 3500 students in Chile from 1970 to 1977, examining the in-school and out-of-school factors that determine the degree of academic achievement and relating them through schooling to entrance and success in the labour market.

## EIGHT YEARS OF THEIR LIVES



**Root crops in Eastern Africa: proceedings of a workshop held in Kigali, Rwanda, 23-27 November 1980**. Published in September 1982, IDRC-177e.

This publication gives summaries of papers presented at a workshop that focused on cassava, sweet potato, yam, and cocoyam (with particular emphasis on cassava and

sweet potato because of their relative importance) in Eastern Africa. Researchers and policymakers identified constraints to root-crop production in the region, suggested means to establish national and international cooperation, and considered the future development and research in root crops in the region.

**Agricultural policy in India: growth with equity**, by J.S. Sarma. Published in September 1982, IDRC-201e.

This monograph attempts to review agricultural policies as they have evolved in India, assess their impact on the economy, examine the conflicts between growth and equity in the agricultural sector, discuss methods of reconciling or minimizing conflicts, and suggest possible outlines of policies and strategies that could be adopted to achieve growth with equity.

**Intercropping: proceedings of the second symposium on intercropping in semi-arid areas, held at Morogoro, Tanzania, 4-7 August 1980**. C.L. Keswani and B.J. Ndunguru, editors. Published in September 1982, 168 pages, IDRC-186e.

Agronomy, plant breeding, plant protection, and farming systems research concerned with intercropping — the mixing or interplanting of a number of different crops on the same piece of land at the same time — are covered in this publication. The proceedings of a previous symposium, held in 1976, have been published as

*Intercropping in semi-arid areas*, IDRC-076e. This publication gives the full text of selected papers and summaries of all others presented at the symposium, together with an account of discussions.

**Livestock in Asia: issues and policies**, Jeffrey C. Fine and Ralph G. Lattimore, editors. Published in September 1982, IDRC-202e.

An edited version of papers presented at a conference on livestock issues and policies in Asia held in Singapore on 2-4 March 1982, this publication addresses a number of social science and economic research questions. Livestock production, national and international marketing, and policy issues are included, and an attempt has been made to take stock of pertinent research and identify priorities for future research.

**Remote sensing and development: report on IDRC-supported projects in the Sudan, Bolivia, Tanzania, Bangladesh, and Mali**, by Robert LeBlond. Published in July 1982, 24 pages, IDRC-174e. (*Il existe également une édition française de cette publication.*)

This report provides information on a series of projects dealing with the application of remote sensing in five developing countries. The IDRC-supported projects aimed to provide maps of the natural resources in specific areas in each of the countries as a basis for development.

**Fish by-catch . . . bonus from the sea: report of a technical consultation on shrimp by-catch utilization held in Georgetown, Guyana, 27-30 October 1981**. Jointly sponsored by the Food and Agriculture Organization of the United Nations and IDRC. Published in July 1982, 163 pages, IDRC-198e.

The publication presents a summary of technical discussions and the final recommendations from the international consultation: topics covered include assessing postharvest losses; recovery, handling, and preservation aboard vessels; processing on shore; actual and potential markets; economic aspects; regulatory, legal, and monitoring aspects; and a survey of national and regional developments in the recovery and use of fish by-catch in developing countries.

**Low-cost transport in Asia: a comparative report on five cities**, by Romeo B. Ocampo. Published in September 1982, 77 pages, IDRC-183e.

This monograph reports and compares the results of five studies of low-cost transport systems conducted during 1976-1977 in selected cities in Indonesia, the Philippines, Thailand, and Turkey. Research issues, objectives, and methods, transport systems in the context of the cities, their physical and operating features, and economic aspects are described, as are the socioeconomic characteristics of drivers, owners and users.





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# Reports

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**Livestock:  
resource  
or risk?**





# LETTERS

## Refugees — a joint effort

I found your recent article on immigration trends in Latin America quite interesting (*Reports* 11(2) July 1982). But, for the record, I would like to point out one minor error.

You mention that about 900 Chilean refugees settled in Canada with help from World University Service of Canada (wusc). In fact, the refugees were settled by a special group formed by a number of organizations, including wusc, and learned societies. Wusc agreed to be the recipient of a Ford Foundation grant which the Canadian Association for Latin American Studies managed to negotiate. I know because I was the wusc staff person who helped organize the committee and convinced wusc to take on the financial responsibility. The money was administered by the Association of Universities and Colleges of Canada.

So your comment on wusc's role isn't entirely wrong, but I think the others involved deserve equal mention.

George Tillman  
Canadian Bureau for  
International Education  
Ottawa, Canada

## Energy: rational use

I found your article "Powering development: energy for the rural poor" (*Reports* 11(1) April 1982) very interesting.

It is true that the scarcity of traditional fuels is becoming critical and, rightly so, people are searching for realistic, practical solutions to this problem. Firewood in Africa is an especially urgent concern.

I do not think, however, that the energy alternatives mentioned in

the article will change the magnitude of the problem very much.

Burning animal dung and converting organic matter into biogas do not seem to me to be satisfactory solutions, as most of the countries faced with the problem of a firewood shortage are in the Sahel, or along its northern and southern borders. The soil in these areas is very low in organic matter. This same component is vital for retention of water and nutrients, and to maintain biological activity. The removal of this organic matter — whether it be animal dung, dry foliage, humus, or whatever — therefore constitutes a direct impoverishment of the Sahelian environment.

As far as solar energy is concerned, we know that the possibilities are limited and that its use creates a new kind of economic and technological dependence in Third World countries. As a source of heat energy (for preparing meals and so on) it is insignificant. Wind energy offers possibilities in some regions, but in others the slight or erratic wind system makes rational exploitation impossible.

The establishment of village woodlots is certainly helping to solve the firewood problem around large centres of population. Yet the cost of such forestation, which reaches about U.S. \$1000 per hectare on the average, is often not mentioned. It requires substantial investment, and the results are not always convincing.

In the several brief articles in *Reports* covering the energy problem, particularly

Africa's firewood shortage, various kinds of modern technology (biogas, solar energy, and so on) are examined, but they do not go to the root of the problem. Of course the populations have increased, but the treed and forested spaces in Africa are far from depleted.

I think that a rational use of these natural resources would provide a solution to our problem without requiring the use of sophisticated technology that gives rise to additional difficulties.

Thus, without wishing to dismiss these new alternatives, I think that it would be useful to work toward improving the management and exploitation of the natural environment, not only to produce a large part of the necessary fuel, but to better conserve the soils (which are so fragile — especially where the vegetative cover has been eroded).

But, I am sure that IDRC is not unaware of these aspects of the energy problem in the Third World.

C.L. Vanpraet  
Dakar, Senegal

## More cowpea recipes

It was interesting to note the brief about cowpeas included in the July 1982 *Reports* (11 (2)).

In a related legume utilization project, Dr Jos. Eusebio, *et al.* at the University of the Philippines at Los Baños (Institute of Human Ecology, UPLB, College, Laguna 3720, Philippines) produced a recipe booklet entitled *Legumes your cheapest body-building food*.

A number of legume recipes have also been included in recent books produced by the Ethiopian Nutrition Institute (P.O. Box 5654, Addis Ababa, Ethiopia) and by the Andrah Pradesh College of Home Science (Andrah Pradesh Agricultural University, Rajendranagar, Hyderabad 500 030, India). I think these were published with the support of the Swedish International Development Agency and Unicef. Both

are excellent references for traditionally used recipes and contain useful information concerning the nutritive value per serving.

Sally M. Vogel  
IDRC  
Edmonton, Canada

## Quinoa seed sources

Your article on quinoa, "Seeds of gold" (*Reports* 11 (2) July 1982), states that the IDRC-supported project at the Bolivian Institute of Agricultural Technology (IBTA) collected 1500 types of quinoa to form a germplasm bank. It should also have stated that the International Board for Plant Genetic Resources (IBPGR) provided U.S. \$17 400 in 1977-1979 to the Interamerican Institute of Agricultural Sciences (IICA) in Costa Rica to collect Andean grains (among them, *Chenopodium quinoa*) and tubers in Bolivia, Ecuador, and Peru.

Several organizations from the three countries cooperated with IICA in the accomplishment of this project, and IBTA was the major one cooperating in Bolivia. The samples collected are stored in the University of San Antonio Abad (Cusco, Peru), the Universidad Nacional Técnica del Altiplano (Puno, Peru), IBTA's experimental stations at Belén and Patacamaya, and other organizations in Ecuador. The leader of the whole project is Dr Mario Tapia. He started the project while working for IICA in Bolivia and later moved to Peru. And although the final report of the project has not been submitted, the number of quinoa samples collected in the three countries may amount to more than 1000.

Further, in 1979, \$4500 was provided to IBTA to improve the seed storage facilities at the Belén and Patacamaya experimental stations.

Thank you for the attention you will give to IBPGR activities on this crop in the Andean area.

J.T. Williams  
Executive Secretary  
IBPGR, Rome, Italy



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jacques Dupont; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee.

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The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogota D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 El Messaha St., Dokki-Giza, Cairo, Egypt).

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**Cover:** Alpaca and friend in Peru. Animal production in developing countries requires careful management to reduce potentially harmful costs and increase benefits. See stories page 4 and following.

**Back cover:** Landsat image of the Awash river basin, Ethiopia. African countries are using satellite remote sensing technologies to plan development. See story page 25. NASA photo.





# FEEDING FOLLY?

BOB STANLEY

**T**he past few years have seen repeated good news on the population front: the population growth rate is at last slowing down, dropping from over two percent in the 1960s to its current level of about 1.7 percent. That decrease, if it is sustained, means that there will probably be about six billion people living on earth in the year 2000, instead of the roughly 7.5 billion projected at the earlier rate.

It is an encouraging trend, but it should not be allowed to disguise the hard fact that the world's population is still growing at the rate of some 70 million each year. There are many who question whether or not it will be possible to continue to feed that many more people year after year. Grain production alone would have to increase by 30 million tonnes every year merely to keep pace with that kind of growth, even assuming that demand remained static, which is unlikely.

There is a growing body of opinion, however, which says that this planet should be able to support a far larger population than at present. It is a fact that there is at present more than enough food produced to provide an adequate diet for every adult and child on earth. Yet, in the midst of plenty, there is widespread malnutrition in many parts of the world, primarily — though by no means exclusively — in the developing countries. Accurate statistics are hard to pin down, but it is generally accepted that on any given day there are at least 500 million people who don't get enough to eat.

There is yet another strange statistic: More grain is consumed by livestock in the developed nations than is eaten by people in the developing world. About one-third of the world's grain — 500 million tonnes — is used not to feed people, but to fatten livestock. And the proportion is increasing. Feed

grain use in the U.S.S.R., for example, doubled in a decade to 180 million tonnes by 1980.

Certainly that livestock provides food for people, but it does so in a very inefficient manner. To produce one kilogram of grainfed beef requires close to 8–10 kg of feed grain. Pigs are much more efficient, requiring only about four kg of grain to produce a single kg of pork, and chickens are better still, with a ratio of only about two-to-one.

Of course not all cattle are raised, or even fattened on grain. In most of the developing world they are raised entirely on pastures. Currently, about 23 percent of the world's land surface is used to raise livestock of one kind or another. By a tidy statistical coincidence, there are roughly three billion hectares supporting about three billion animals. That is roughly double the amount of land presently devoted to food crops. Furthermore, one hectare





## Animal production: too high a price to pay for protein?

under meat production produces about one-fifth the amount of protein of a similar area planted to cereals, and about one-tenth the protein available from a hectare of legumes, such as soybeans or cowpeas. During the 1970s, production of soybeans in the United States doubled from 43 to 85 million tonnes. Virtually all that increase went to feed cattle.

North Americans are the world's leading consumers of both meat and grain. The average American consumes about 800 kg of grain each year, but only about one-fifth of that is eaten directly — most of the rest is consumed in the form of meat or animal products. In the Third World the average cereal consumption is about 200 kg per year, and four-fifths of it is consumed directly. North Americans obtain about one-quarter of their calories from cereals, three-quarters from livestock. In the Third World the pro-

portions are roughly reversed.

In much of Asia, and in many other parts of the world, fish is a major source of animal protein. But the increase in the world's fish catch slowed almost to a standstill in the 1970s, increasing by just three percent to 72 million tonnes in 1980. And fully 30 percent of the catch — almost 22 million tonnes — is not used for human consumption, but is converted to fishmeal, most of which, of course, is fed to livestock.

What this welter of statistics illustrates is a gross misuse of resources. Livestock are turned into "reverse protein factories" by feeding them protein-rich grain, legumes, and fishmeal in order to produce a rather smaller amount of protein in the form of meat.

And by far the greater proportion of that meat goes in over-large servings to feed the people of the industrialized

(Opposite page) Cattle identification ceremony, Peru: livestock production may not be efficient, but some cultures value animals highly. (Above, left) Pigs are more efficient at converting feed to protein, and raising them on agricultural wastes may be even more practical. (Below, left) Properly managed, animals can improve the land. These Barki sheep in Egypt will enrich the desert soil with their droppings.

nations, the vast majority of whom consume far more protein every day than their bodies need, and far more calories than is good for them.

There is another even greater irony in all this. Easily the greatest number of the world's livestock are ruminants — cattle, sheep, and goats — which have very simple nutritional requirements because they are capable of producing their own protein. Ruminants effectively have two stomachs. In the first, called the rumen, microbes digest all kinds of roughages that would be indigestible to people, pigs, or poultry. In the process the rumen produces microbial protein that is then digested by the animal's true stomach to produce meat or milk. Cattle are usually fed grain simply to make them fat.

The world is in this situation largely as a result of a phenomenal increase in production, and consumption, of meat in the past generation. Between 1950 and 1975 the world's beef production doubled; and mutton production increased by half. In recent years this growth curve has leveled off, but only because production in the industrialized countries, particularly the U.S.A., has fallen. In 1980, U.S. cattle production was actually about one million head below the 1970 level.

In the developing countries of Asia, Africa, and Latin America, however, production is still growing in response both to increased population and increased demand. And just as population will continue to increase, albeit at a slower rate, so will demand. Studies by the International Food Policy Research Institute (IFPRI) clearly indicate that as nations develop, as their GNP increases and more money finds its way into the pockets of the people, the demand for meat increases.

People eat meat because they like it, but there are other good reasons — animal protein provides us with many of the eight essential amino acids that our bodies are unable to manufacture for themselves. Without these we could not survive. The right kind of protein can be obtained also from eggs and dairy products, and from legumes such as soybeans, among other sources.

There are other arguments in favour of livestock. They are capital, security, prestige, and social currency in many cultures. They provide not only meat and other foods, but a host of by-products. Leather, wool, and down are all major money earners. Cattle dung provides both fuel and fertilizer — it is the only source of fertilizer for 40 percent of the farms in the developing world. Draft animals remain a primary





*Giraffe and cattle share the range in Kenya: monitoring them helps conserve the land.*

## ANIMAL WATCHING

At six o'clock in the morning, a small aircraft takes off from an airstrip near the Masai Mara game park in southwestern Kenya. As the plane is flying low and at a speed of only 150 kilometres per hour, the biologist in the front seat can record topography, vegetation cover, and other environmental features of the land below.

Two observers in the rear seat record their estimates of wild and domestic animals. They also photograph animals whenever they appear to be in groups of more than 10.

All this exercise is accomplished in the first four hours of daylight, when there is little air turbulence and animals can be seen clearly because they are actively feeding.

Later, at the headquarters of the Kenya Rangeland Ecological Monitoring Unit (KREMU) in Nairobi, the tapes are transcribed and carefully matched with the photographic records and information collected from KREMU's ground ecological monitoring stations. In this way, the range ecologists ensure that the results of their aerial surveys are accurate.

Most of Kenya's 500 000 square kilometres of rangeland (or about 87 percent of the country's land) is occupied by pastoralists, domestic livestock, and wildlife. Because of the low and erratic rainfall, range areas have for a long time been considered of little economic value to the country. Only recently did the government realize that rangeland resources such as wildlife and livestock can contribute to Kenya's economic development.

KREMU was established in 1976 to

provide the Kenyan government and development agencies with a continuous flow of information on the relationship between vegetation changes and the number and distribution of livestock and wildlife in the rangeland. It collects this information from the air, through satellite pictures, and by ground surveys.

A survey of all the range areas, completed in 1978, provided the government for the first time with information on the abundance and distribution of wildlife and livestock. Planning for livestock marketing, for example, has become easier with this data. Similarly, wildlife can be managed to ensure conservation of their habitat as well as substantial cash flow to the exchequer from wildlife-related business.

The International Livestock Centre for Africa (ILCA), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the United States Agency for International Development (USAID) are some of the organizations that use KREMU's data to implement their projects in Kenya's arid lands. The Unit also provides technical assistance for the aerial count of livestock populations in other African countries. Last year, KREMU's aerial observers helped to count wild and domestic animals in Senegal.

Among KREMU's numerous technical reports is a comprehensive review of Kenyan plants and their uses. Although compiled primarily for range ecologists, the book has proved to be beneficial to a wide range of users including agriculturalists, foresters, agroforesters, educationists, and environmentalists.

*Fibi Munene*

source of energy for small farms in most developing countries — in fact it is estimated that roughly 30 percent of the world's croplands are still tilled by draft animals. Animals can also make good use of, and even improve, marginal lands that will not support crops, and they can turn agricultural and other waste products into food.

The practical solution to the situation, then, is to learn to use our resources more effectively, to develop a better balance between crop and animal production. Despite continuing increases in production, the developing countries are not as a rule very efficient in their animal production systems. Africa, Asia, and Latin America have two-thirds of the world's cattle, but they produce only one-third of the meat. They have just over half the world's dairy cows, hens, and pigs, but produce only one quarter of the world's milk and a little more than one-third of the world's eggs and pork.

There are many regions of the Third World where the animal population is already dangerously high. In some countries of the Middle East, for example, flocks of sheep and goats are three to four times the size that can be sustained for any lengthy period. The short-term result is degradation of the fragile grasslands, which further reduces their carrying capacity. The end result, very evident in the arid regions, is desertification. Ways must be found, then, to increase production without necessarily increasing the numbers of animals. Research supported by the IDRC is taking a number of approaches to improving animal production systems.

- One of the principal reasons for low animal productivity is lack of feed supplies. This is particularly true of the nations of the arid and semi-arid regions, where a great deal of fodder is required to support the herds through the long, dry summer. In Egypt and Sudan, researchers are looking to agricultural by-products as a supplement or an alternative to the use of feed grains and green fodder. The supplies are plentiful. Egypt's four main crops — rice, maize, sugarcane, and cotton — produce eight million tonnes of "waste" each year, roughly the same volume as the country's annual production of conventional animal feeds. The Egyptian research into by-product utilization started five years ago, and is the most advanced. Researchers at the University of Alexandria have systematically tested a wide range of by-products on their experimental farm — including wastes from agro-industries such as a marmalade factory, a match factory, and a winery — and studied their use by sheep, goats, and dairy cattle. They have developed a number of promising feed mixes, and are now in the process of testing them, both commercially and at the farm or village level. Parallel with this work, a number of projects are also developing summer forage crops to supplement the use of by-products. Other IDRC-



supported research on the use of by-products for animal feed includes projects in Guatemala (coffee pulp), Mexico (sugarcane), Bali (copra, rice bran, cassava), and Thailand (cassava).

● In tropical Latin America there are also vast areas of savanna land that will not support crops because the soils are too acid and infertile — perhaps 50 percent of the region's land falls into this category. Scientists at the International Centre for Tropical Agriculture (CIAT) in Cali, Colombia, are working to develop these lands into rich pastures, to increase production of meat and milk, and at the same time release for crop production other more fertile land that is presently used for grazing. The key is the selection of forage legumes and grasses that can survive on such poor soils and provide nutritious grazing and fodder for cattle herds. More than 7000 plants have been collected from the wild, among them many that were previously considered as mere weeds. One of the most promising species is *stylosanthes*, a native Latin American plant that has been successfully adapted as a forage crop in Australia. The researchers believe the pasture improvement eventually will result in a tenfold increase in productivity. The program also has great significance for many other areas of the developing world where conditions are similar. Pasture improvement research is also supported in several countries of the Caribbean and the Middle East.

● In Central America IDRC is supporting several research projects aimed at improving farmers' traditional methods of raising livestock. Researchers in Costa Rica and Panama believe the local system of keeping small, mixed dairy-beef herds, as well as raising some crops, has the potential to increase both milk and meat production. They are experimenting with use of crop by-products and other innovations in close cooperation with the farmers. In El Salvador, many smallholder farmers keep a few local pigs, feeding them mostly on waste scraps. The native breeds of swine are hardier than imported breeds, and again the researchers believe they have potential for much greater meat production given the right kind of improvements in feeding and management.

● Production of beef and dairy cattle in much of the developing world is severely limited by two insect-borne diseases that are fatal to the cattle herds. East coast fever (theileriosis) is carried by a tick that is picked up by the animals while grazing, and is responsible for at least 500 000 cattle deaths annually in Africa alone. Sleeping sickness (trypanosomiasis) is transmitted by the tsetse fly throughout most of tropical Africa. Research aimed at eliminating or controlling these two pests is being carried out at the International Laboratory for Research on Animal Diseases (ILRAD) in Kenya. The researchers are concentrating on the parasites that actually cause the diseases, and on

the mechanisms that allow some species, such as the African Zebu cattle and some native breeds of sheep and goats, apparent immunity. They have recently succeeded in culturing trypanosomes in the laboratory, an important step toward finding out how these microscopic pests survive in the host animal. They believe it is only a matter of time now before practical vaccines will be available to protect against the cattle killers. If they are correct, livestock production in affected areas could be doubled and huge areas of unused land could be opened up for production.

These are a few examples of research that could help to increase the supply of animal protein in the developing countries, where it is most needed,

without adversely affecting production of food crops. But equally important is to ensure that the right people benefit from the research. Beef consumption in the U.S.A. has not dropped nearly as much as beef production. The secret to eating more while producing less is to import — and the U.S.A. has become a major beef importer. Most of that beef comes from Latin America. Thus a region that is already short of protein, unable to resist the lure of the dollar, squanders its resources to supply a region that already has too much.

In the final analysis, the decisions about who goes hungry and who doesn't are made not by the producers but by the distributors. Hunger is not so much a result of scarcity of food as it is a function of poverty. □



(Top) Sugarcane bagasse in Mexico being ground for animal feed. Such agricultural wastes or by-products do not divert grains from human use. (Bottom) In Egypt, orange peels from a marmalade factory, mixed with pea pods, provide a cheap ration.



# HIGH-LEVEL INFORMATION

## AN INFORMATION CENTRE ON SOUTH AMERICAN CAMELIDS

STELLA DE FEFERBAUM

**V**ast areas of the South American Andes lie above 4000 metres. At this altitude, climatic conditions are severe, and the differences between daytime and nighttime weather and temperatures are drastic. Frost occurs on some 300 nights a year. Average rainfall varies greatly from one area to another, and droughts are not uncommon.

Under such conditions, agriculture becomes a hazardous business, limited almost entirely to native crops first sown by the pre-Columbian inhabitants of these lands. Animal production, using natural pasturelands, could offer a more reliable source of food than agriculture.

This is where the South American camelids — alpacas, llamas, vicunas, and guanacos — could play an important role. Fully adapted to the Andean highlands, these animals are now found on approximately five million hectares of pastureland in Peru, Bolivia, Chile, Ecuador, and Argentina. For some 200 000 rural families, camelid raising constitutes the principal source of livelihood. The wool of these animals is used in the textile industry. Camelid meat

is often the sole source of animal protein, and the skins are used to make warm garments or as materials for handicrafts. The animals are also used as beasts of burden.

Llamas are found from the Ecuadorian sierra to the northwestern region of Argentina. Alpacas roam over a region of about 200 kilometres around Lake Titicaca in Peru and Bolivia. Both species have been domesticated. Their importance lies in the fact that, unlike beef cattle and sheep, they can survive and reproduce above 4250 metres where no crops can be grown.

Today, it is estimated that 80 percent of all alpacas and llamas are owned by small farmers who use the land communally and earn individual incomes of no more than U.S. \$200 per year.

Vicunas and guanacos are wild animals. The vicuna lives mainly in the altiplano region of Peru and Bolivia, while the guanaco is found in the Patagonia area of Argentina. Both animals are endangered species, protected by law in the three countries where they live. Illegal hunting and trade of these animals nevertheless continue to threaten their existence.

All of these camelids are native species. However, their survival and well-being are plagued by several health, nutritional, and management problems that impede the development of camelid raising. Overcoming these problems would mean better standards of living for rural communities and a decrease in rural migration to cities.

Scientists in the region have long been interested in these animals. But available information on them is scattered and remains largely unknown because no central agency exists to organize, channel, and disseminate the information at both national and international levels.

The need for an information centre specializing in South American camelids became clear in 1978 when Bolivia's Wool Promotion Institute (INFOL) (see box, "The Institutes") approached IDRC with the idea of setting up such a centre, much like the one on cassava that functions at the International Centre for Tropical Agriculture (CIAT) in Colombia.

At that time, IDRC was studying a research proposal on South American camelids presented by the Institute for Tropical and High-Altitude Veterinary Research (IVITA) in



*Llamas come to market in Peru: a more certain livelihood than crops for small farmers.*



Peru, which also has a considerable amount of material on this subject.

After some study and consultation, IDRC thought it best to counsel these two institutes to join in one project. To this end, a meeting of IVITA and INFOL officials was called in 1981 to examine the possibility of coordinating activities and to draw up a proposal for the creation of a specialized centre, run by both, whose purpose would be to analyze information on South American camelids.

### THE PROJECT

The new centre, to be based at sources in each of the Institutes, will collect, process and disseminate information on South American camelids. Its services will be available to interested institutions and individuals. By furthering the knowledge of the four camelid species, it aims to support the theoretical and practical work undertaken to increase the production and utilization of these animals.

The information may open new horizons for the inhabitants of the high Andes, who count among their assets a handful of camelids. □



More information about camelids will increase their usefulness.

## THE INSTITUTES

**Instituto de Fomento Lanero** (Wool Promotion Institute), (INFOL). Established by the Bolivian government in 1977, the Institute is responsible for improving camelid and sheep production and productivity. Its activities include research into production, marketing, and industrializing camelid products and by-products, as well as formulating policies designed to raise the living standards of farmers. The Institute produces, adapts, improves, and disseminates scientific and technological knowledge on these subjects.

With the protection agreement on the vicuña in 1979, INFOL became a multinational information centre on camelids. Currently, the centre has almost one thousand processed documents on this subject. Centre director, Armando Cardozo, an expert on camelids, has also compiled a three-volume, 2000-item bibliography on this subject.

**Instituto Veterinario de Investigaciones Tropicales y de Altura** (Institute for Tropical and High-Altitude Veterinary Research), (IVITA). The Institute is one of three research centres located at San Marcos University in Lima, Peru. Created in 1962 by an agreement between the Peruvian government and FAO, the Institute is comprised of a technical and administrative centre in Lima, three main stations and two substations.

IVITA receives international support from Switzerland, the United States Agency for International Development (USAID), and IDRC, among others.

IVITA research has made a significant contribution to current knowledge of South American camelid biology. The Institute has also conducted very valuable research on parasitic diseases, the physiology of digestive processes, and reproduction in alpacas.



## THE INFORMATION NETWORKS

The information centre on South American camelids will be the newest of specialized information centres supported by IDRC. In these centres, information specialists and subject specialists cooperate to evaluate and consolidate information in narrowly defined subject areas to meet the expressed needs of users.

During the past years, IDRC has supported a number of such centres on specific crops: cassava (Colombia); tropical grain legumes (Nigeria); sorghum and millets (India); coconuts (Sri Lanka); field beans and lentils (Syria); and bananas and plantains (Panama). Other centres deal with a wide variety of topics: on-farm irrigation (Israel); water

buffaloes (Thailand); diarrheal diseases (Bangladesh); African maps (Ethiopia); rural youth activities (Costa Rica); packaging materials and techniques (Hong Kong); geo-technical engineering (Thailand); ferrocement (Thailand); and environmental sanitation (Thailand).

Placed in institutions that are centres-of-excellence for research in the subjects to be treated, these information centres can tailor information to the client's language and particular interest. And because of their narrow subject focus, collections of materials — often unavailable through other means — can be accommodated without necessarily having recourse to a computer for retrieval purposes.



*Sudan's refugees:  
moving from  
dependence to  
self-sufficiency*

## NEW ROOTS

J.R. ROGGE

**T**he world's refugees now number over 10 million. Nearly one-half of them are in Africa. At least one out of every 100 Africans is a refugee, and some regions are more seriously affected than others. Twelve states, mainly in the Horn of Africa and in East and Central Africa, have borne most of the responsibility for supporting this displaced population. Four of these countries — Sudan, Tanzania, Uganda, and Zaire — have now carried the burden for the best part of two decades.

The strains that such support places on the economies of countries of asylum are enormous. They are all poor countries, among the world's least developed. Moreover, almost without exception, they have had to find local solutions to their refugee problems. Unlike Southeast Asia or even Latin America, where many refugees are eventually resettled to western industrialized countries, few African refugees are ever likely to leave the continent. Nor are their chances of returning to their home countries very great.

Thus African asylum states have come to recognize the need to create viable local solutions to their refugee dilemmas. The international community, and especially the United Nations High Commission for Refugees (UNHCR) and the World Food Program (WFP), as well as a host of nongovernmental agencies, have also risen to the challenge. Much progress has been made in providing refugees with means to contribute to their own maintenance and upkeep. Indeed, in some cases, the objective of reducing the refugees' dependence upon their hosts has been combined with national rural development strategies aimed at integrating refugee settlements into broader programs for improving the use of national land resources. Such is the case in Sudan.

Sudan's refugee problem is one of the oldest in Africa. Over the past five years it has also become one of the largest. There are currently about 550 000



*Eritreans in Sudanese camp: How to turn a refugee into a self-reliant settler?*



refugees in the country; one refugee for every 33 Sudanese nationals. But because of their uneven distribution within the country, this ratio reaches 1:4 in eastern Sudan, and 1:6 in Equatorial Sudan. Such concentrations clearly place tremendous strains on local infrastructures, as well as exacerbate already overextended supply networks of essential commodities.

Sudan's refugees originated primarily in Ethiopia and Uganda. The former are mostly Eritreans exiled as a result of the protracted war between Eritrean secessionist forces and the Ethiopian authorities. Widespread internal conflict elsewhere in Ethiopia since the 1974 revolution has also added many Ethiopians to Sudan's caseload. The number of Ethiopian and Eritrean refugees in Sudan is now estimated at around 420 000.

In southern Sudan, two major waves of refugees have crossed from Uganda. A first wave followed the ouster of Idi Amin in 1979. Then, as the guerilla war in northern Uganda intensified in 1981, a second wave entered Sudan. This movement is still under way, and the number of Ugandans now in Sudan is estimated at over 120 000. There is also a small refugee community from Chad, of around 12 000, in western Sudan.

The rapid influx of refugees — from less than 100 000 in the early 1970s to more than half a million today — has strained Sudan's resources. All have had to be fed, housed, and provided with health care and schooling. While the international community has helped meet some of these needs, the ultimate responsibility has fallen on the government of Sudan.

Moreover, Sudan's problem has been aggravated during the last five years by the fact that an ever increasing proportion of the refugees are of urban origin. Historically, most of Africa's refugees have been rural-to-rural migrants. Solutions to their absorption and integration have thus been essentially confined to rural areas. Sudan has no shortage of potentially good agricultural land, and rural refugees have been readily settled on agricultural schemes, or have spontaneously integrated into indigenous rural communities.

But refugees originating from the cities of Ethiopia, Eritrea, or Uganda are not as easily accommodated. It is estimated that as much as 20 percent of the current refugee population is of urban background. Such numbers place great pressures on existing urban infrastructures and intensify unemployment.

Yet these refugees often possess high levels of education and skills, skills that are lacking among the Sudanese population, or which have migrated to the labour markets of Saudi Arabia. Consequently, many of these urban refugees represent a potentially productive resource. The challenge is how best to integrate them into the local urban economies.

In the rural areas, where most of the refugee population is domiciled, it is equally rational to view the migrants as a human resource. The rich agricultural potential of much of Sudan has long been recognized, as have two of the major constraints to its full exploitation. One of these constraints is lack of water. The other is shortage of skilled agricultural workers.

Not all rural refugees, of course, can be seen as agricultural labourers. Many are nomadic pastoralists and do not readily adapt to sedentary cultivation. The need to reduce the refugees' dependence on their host as quickly as possible, combined with the reservoir of underused or even unused land within the general regions where the refugees are located has naturally suggested some solutions. Many of the refugees have skills and experience in farming, and it is not surprising that Sudan has opted to implement programs that emphasize rapidly making the refugees self-sufficient, either directly through farming, or as wage labour on established mechanized and irrigated farms. In the long run,

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*Although difficult  
to develop,  
refugees  
are potentially  
productive resources  
in the Sudanese economy*

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such strategies do not only create a refugee population that is independent of government handouts, but one that also contributes to broader national development objectives.

The majority of the refugee settlement schemes in eastern Sudan, and all of those in southern Sudan, are agricultural land settlements. Here refugees, grouped in villages of 1000 to 7000 people, are given land to clear and cultivate for themselves. Their farms are generally between 5 to 10 feddans (1 feddan = 0.42 hectare), and most of the land is used for staple crops, such as sorghum in eastern Sudan, or maize in the south. The more advanced or progressive villages are also able to produce substantial surpluses for sale. Some even venture into limited cash-cropping, growing sesame, groundnuts, or tobacco.

Until the refugees reach subsistence level, WFP food rations are provided. Except for the more recent settlements, few in eastern Sudan now require such food assistance. In southern Sudan, however, all of the villages

are still at least partially dependent on WFP rations.

While the agricultural land settlements are making reasonable progress, the second group of rural settlement schemes — the wage-earning settlements — are more problematic. Although sound in concept, these settlements are not working well in practice. Located adjacent to large-scale irrigated development schemes, the refugees are expected to derive an adequate income to meet their daily needs by selling their labour. They do not receive any land for themselves.

There is currently much dissatisfaction among refugees with both the kind of labour available, and the level of income that can be generated. This is creating increasing pressure on the authorities to re-evaluate this type of refugee settlement scheme and to provide the refugees with at least some land for their own use. Certainly there is considerable disparity between the two types of rural settlements, and it is doubtful whether any forms of external inputs from voluntary agencies could markedly change the current dissatisfaction with these schemes.

The third type of settlements — the semi-urban settlements — are fewer in number, and contain only a fraction of the total urban refugee population. Similar in principle to the rural wage-earning settlements, they are located close to towns, and at least some of the employment is expected to be of urban character.

While the authorities strive to relocate many of Sudan's urban refugees in such settlements, most are reluctant to be resettled, preferring to remain "spontaneously" integrated. The success of the semi-urban settlements will therefore depend to a considerable degree on the quality of the housing available and services provided, such as clean water and access to transportation networks. But if the resettlement process involves little more than a transference from urban slum to semi-urban shantytown, as has been the case with the Tawawa settlement near the town of Gedaref, then the opportunity for the effective development of an urban labour force will have been missed.

The challenge for the Sudanese authorities is there. But they cannot achieve their task alone. Help from the international community is needed for adequate development planning and research, for the provision of basic health and educational services, for the creation of improved water supplies, and for viable extension services in both the rural and urban areas. When such assistance is provided at an adequate level, not only do the refugees benefit, but local Sudanese communities in or around the schemes find their quality of life upgraded. □

*Dr J.R. Rogge of the Department of Geography, University of Manitoba (Winnipeg, Canada), received an IDRC Professional Development Award in 1981 to study the problems of Sudan's urban refugees.*



## Nonessential drugs banned

In an effort to reduce costs and extend health protection, the government of Bangladesh has banned 237 "harmful" drugs and ruled that 1505 "unnecessary" ones be withdrawn or reformulated.

The new policy seeks to promote the manufacture and use of the 150 essential drugs recommended by the World Health Organization (WHO) as sufficient to the basic health needs of the majority of people in developing countries.

Banned drugs include a range of products deemed "unnecessary, useless drugs and drugs of doubtful efficacy." Vitamin tonics containing alcohol were singled out as "highly misused, dangerous, habit-forming" drugs. Antidiarrheal drugs such as Enterovioform and Mexaform (Ciba-Geigy), and other substances now banned or withdrawn from the market in developed countries, were also outlawed.

The move has been welcomed in Bangladesh by voluntary health groups, who have frequently raised alarms about the dangers of inappropriate drugs circulating in the country without doctors' prescriptions, and at high cost.

About 75 percent of the pharmaceutical trade in the country is controlled by just eight foreign-based companies. It is hoped the new legislation will concentrate manufacturing on lower-cost generic drugs, and enable local firms to compete more effectively. However, an association of pharmaceutical

companies in Bangladesh — including six of the leading multinationals — tabled an appeal in which it was suggested that small- and medium-sized producers and exporters would be hard hit by the new law, and that local production of medicines might decline by as much as 80 percent. (*Nature*)

## Cheap drugs

The World Health Organization (WHO) has passed a resolution adopting a policy for patenting drugs and health technologies developed through projects it supports, "where such rights and interests are necessary to ensure development of the new technology."

The new policy may mean that new discoveries are made available more rapidly and at reduced costs to developing countries. The research and development costs of new technologies for the prevention, control, and treatment of tropical diseases important to developing countries are high. Commercial manufacturers expect to recover the costs of development and production, and make a profit when they establish a selling price. Too often, that price is too high for the developing countries in need of a particular medical technology.

By holding the patents on drugs and technologies developed with WHO sponsorship or collaboration, the international health body hopes to be able to make them available at low cost through nonprofit manufacturing operations.

In the same way, WHO plans to adopt "orphan drugs" — pharmaceuticals

and related technologies for which private enterprise does not foresee sufficient returns to warrant commercial production. (*Reports* 11(3) October 1982, "Sure shots" described one such innovation, a time-temperature indicator for vaccines.)

## Stopping sperm

In the search for a safe and effective male contraceptive, researchers in the department of biochemistry at Mahidol University in Bangkok, Thailand, are attempting to discover and block the mechanism that enables sperm to move through the female reproductive tract towards the ovum and fertilization.

After sperm are generated in the testes, they move through the epididymis duct, where they undergo a maturing process involving biochemical changes. One of the changes may involve activation of a mechanism that makes sperm capable of movement.

The Thai scientists speculate that a substance in the fluid of the epididymis that they have called the "quiescent factor," may prevent the sperm from becoming motile. They think that the quiescent factor attaches itself to the surface of the sperm cell. There it inhibits the process in which stored chemical energy is released in the sperm as mechanical action — the thrashing of the tail that propels sperm through the female reproductive tract. When this factor is diluted in the epididymis, it may be dissolved and removed from the sperm cell surface, thus activating their mobility.

With support from IDRC, the Thai biochemists hope to be able to actually identify the quiescent factor and characterize its action in the epididymal fluid of rats. Better understanding of the maturing process could be the basis of a very specific — and therefore potentially very safe and effective — male contraceptive.

## Oysterfarming in Jamaica

Jamaica imports U.S. \$44 million of fish products every year to meet consumer demands for protein. To displace these costly imports with local products, and in the process provide badly needed employment in coastal farming and fishing villages, the island's Ministry of Agriculture began to develop oysterfarming projects in some of the country's sheltered inlets.

With the aid of an IDRC grant in 1977, Jamaican scientists from the ministry's Marine Laboratory in Port Royal developed an experimental production system that made good use of cheap, locally available resources.

Pieces of old car tire strung beneath floating bamboo rafts proved to be good settling areas for oyster spat (seed) drifting on the tide into coastal mangrove swamp areas. Once spat were established, the strings were transferred to larger rafts in deeper water for growing out to marketable size. Oysters with a shell size of between 70–80 mm long — about 65 percent larger than wild oysters — could be harvested in six months.

Having demonstrated the possibilities of oyster farming in their biological and technical studies, the ministry researchers are now moving into a second phase of research with IDRC support to determine the system's practicality. They will refine the production and processing operations, build up the necessary technical facilities needed to support a local oysterculture industry, and develop appropriate marketing strategies.

## Food directory

A guide to institutes working on food policy aims to provide users with basic information about organizations that analyze food systems from resource inputs to consumers' plates.

Published by the Development Centre of the Organization for Economic Co-operation



and Development (OECD), the directory also gives an account of the comparative characteristics and priorities of institutions, and includes those that engage in education and training, technology diffusion, and project financing as well as research.

*Directory of food policy institutes*, compiled by Duncan Miller and Morag Soranna. OECD Development Centre Publication, IPC Science and Technology Press Ltd., PO Box 63, Westbury House, Bury Street, Guildford, Surrey GU2 5BH, U.K.

### Tsetse rising

The British magazine *New Scientist* reports that the tsetse fly appears to be moving to occupy new habitats at altitudes higher than previously known. The flies' movement into highland areas could mean a disastrous shrinking of the "safe" zones of animal production in Africa as a result of the spread of trypanosomiasis.

Ato Getachew Tikubet, a scientist from the University of Addis Ababa studying tsetse ecology and animal trypanosomiasis in the Finchaa Valley area of Ethiopia, investigated complaints of farmers that cattle grazing on the plateau above the valley were showing signs of trypanosomiasis.

Getachew identified trypanosome parasites in the blood of cattle on the plateau, over 2000 metres above sea level. He also trapped tsetse at this altitude and discovered their pupae in the soil at several sites — suggesting that perhaps the flies can not only live at an altitude normally well beyond their range, but might be successfully breeding there as well.

Uncertainty still surrounds the discovery. Although tsetse flies and infected cattle were found together, the tsetse flies Getachew trapped were not themselves infected with trypanosome parasites. The most likely hypothesis remains that tsetse have carried the

parasite to higher elevations, and further work is concentrated on the search for infected flies on or near the edge of the plateau.

### Attracting tsetse

Essence of ox, or eau de buffalo, may be helping control tsetse flies in Africa, if research of scientists from the Department of Veterinary Services (DVS) of Zimbabwe and the Tropical Products Institute (U.K.) is successful.

The tsetse carries the parasitic disease trypanosomiasis, or African sleeping sickness, that affects both humans and their domestic animals. The flies' habitat covers large areas of the continent, effectively blocking the development of badly needed agricultural resources.

Tsetse flies rely on vision and odour to find the animal hosts of their blood meals. Visual traps have proven effective, but could be much more so if they were also baited with the smells of real host animals.

Dr Glyn Vale of the Zimbabwe DVS has used a mixture of carbon dioxide and acetone to simulate the smell of hosts. Now, in cooperation with Dr David Hall of the Tropical Products Institute, Dr Vale will attempt to identify and isolate the attractive chemical constituents in the odour of tsetse host animals.

Tsetse control programs will be greatly advanced if the work leads to an attractant that can be synthesized and cheaply manufactured for use in traps.

### Programed trees

Farmers in Kenya may soon be growing trees by computer, if the experiments of scientists at the International Council for Research in Agroforestry (ICRAF) are successful.

Agroforestry is a modern approach to a traditional farming practice that mixes trees with other crops and livestock to get the greatest possible yields out of the land.

But agroforestry is more complicated than single

cropping. Scientists therefore have developed a program for use on microcomputers as a tool for managing these cropping systems in order to give farmers the best possible returns on their labour and investment.

MULBUD, the Multiperiod Budgeting and Economic Assessment of Perennial Crop Intercropping Systems, is the brainchild of two Australian scientists. With a grant from IDRC, scientists at ICRAF will work with one of the inventors to apply MULBUD to the analysis of cropping systems used by small farmers in Kenya who work with cocoa, rubber, coconuts, bananas, and other tropical crops and animals.

### Fighting for breath

From colds to pneumonia, acute respiratory infections are major causes of death and poor health among young children in developing countries.

These infections are particularly serious in poor countries because they are often complicated by malnutrition and other illnesses. The large numbers of cases, and the lack of simple and effective measures for their treatment, are taxing health care resources heavily.

But effective prevention and control strategies can only be built on an understanding of the nature and extent of respiratory illnesses: the relative importance of different types of infections, how they attack the organism, and personal and environmental factors that affect the spread of pathogens and influence how susceptible a child will be to them.

With a grant from IDRC, scientists from the University of the West Indies will undertake just such a characterization of acute respiratory infections in Trinidad and Tobago, and Barbados. The researchers may then be able to provide planners with the information necessary to develop appropriate

control programs to make the best possible use of limited health resources.

### Solution not simple

Oral rehydration therapy, rapidly gaining acceptance as an effective first treatment of the loss of fluids and electrolytes during diarrhea (see article, page 16), may itself pose a health hazard in transmitting diarrhea-causing organisms.

A bulletin recently issued by the WHO Diarrheal Diseases Control Program outlines the risks of using locally available drinking water, and the need to decontaminate water before adding the oral rehydration salt (ORS) ingredients.

Preliminary scientific data show that ORS solution prepared with untreated water can support the growth of enteric bacteria at the temperatures likely to be found in the tropical countries where the solution will be most widely used. The bulletin notes further: "ORS solution made from water that is distilled, boiled, or autoclaved may also support the growth of enteric bacteria as these processes do not remove the nitrogen derived from any killed bacteria in the water and a small amount of nitrogen so derived or otherwise present may be sufficient to support the limited growth of bacteria in the presence of salts, glucose, and a favourable pH and temperature. Some nitrogen may even be present as an impurity in the ORS ingredients."

The bulletin calls for further research to determine more exactly whether the use of ORS with "usual" drinking water is associated with more severe or longer-duration diarrhea, or renewed attacks. Suggested research includes investigation of effective chemical decontaminants for use in ORS, and a study of the effects of exposure of the solution to sunlight as a simple means of killing off bacteria.





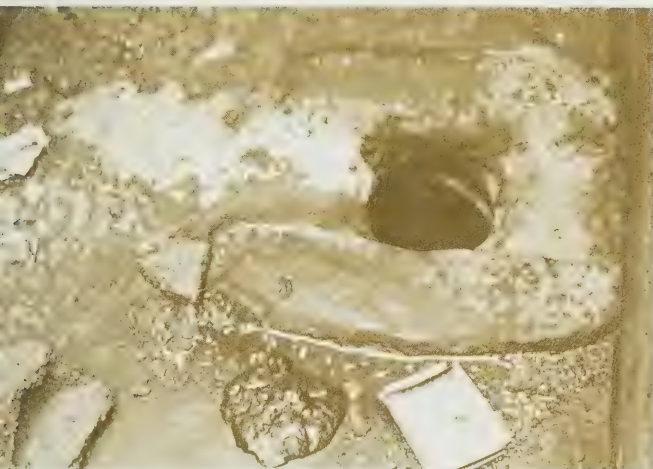
(This page) Some solutions. Breaking the disease cycle may be as simple as teaching children to wash (in Nepal, above), or covering and storing water containers safely (in Guatemala, right) — and reaching people with the message that they can do it.



(This page, top) Water may be safe at the source (right, in Ethiopia), but become contaminated in the household, where normal activity may bring together water, food preparation, and a child sick with diarrhea (left, Guatemala) to create a cycle of disease.

(Opposite page) The problem. (Top) In Bangladesh, a mother keeps anxious watch over her child in a dysentery clinic. (Middle) Foremost among the problems is poor sanitation, here a tavern toilet in Zambia. (Bottom) When people in cities have no reasonable access to facilities, the street becomes the sewer.





*A film for the International Drinking Water Supply and Sanitation Decade*

## BREAKING THE CYCLE

*An understanding of how disease is spread gives people the power to stop it*

**I**n 1980, only 43 percent of the 2.3 billion people living in developing countries had reasonable access to safe drinking water. Only 25 percent had any kind of sanitary facility.

The 1976 Habitat Conference in Vancouver promoted the idea of clean water for all by 1990, an idea that ultimately gained the official endorsement of the United Nations as the International Drinking Water Supply and Sanitation Decade 1981-1990.

Two of the greatest obstacles to achieving the goal are the lack of trained and experienced personnel, and the continued use of inappropriate, expensive technologies where practical, low-cost alternatives could be applied.

The water supply side of the decade — the pumps, taps, and pipelines — has received much attention. Sanitation and waste disposal have not. Yet experience has taught that, without accompanying improvements in sanitation and disposal practices, simply providing clean water will not break the cycle of disease that annually kills as many as six million children under five years of age.

Few concrete attempts have been made to reach water supply planners, extension workers, and the people themselves with the message that

contaminated water supplies and poor sanitation practices transmit disease.

To make this essential connection and to promote some simple methods and practical technologies, the Communications Division of IDRC is producing a short documentary film for health care decision-makers, technicians, and community workers charged with implementing water and sanitation programs.

Using animated sequences to demonstrate the cycle of disease, and live-action scenes, the film will attempt to show the cause-and-effect relationship between poor sanitation practices and gastroenteric disease.

The documentary frankly but discreetly addresses a problem that has usually been avoided on film because of barriers raised in people's minds against a "sensitive" or "distasteful" subject. But there is no elegant way to die of diarrhea.

Written and produced by the Communications Division and the Health Sciences Division of IDRC, in collaboration with the World Health Organization (WHO) and Oxfam (U.K.) — international agencies active in water supply and sanitation programs — the film will be available through development agencies and Canadian missions in developing countries in mid-1983. □

*Jacques Dupont*



Posters and songs: Rehydran for your child to avoid the complications of diarrhea.



## A HEALTHY ATTITUDE

### ORAL REHYDRATION IN EGYPT

ROWAN SHIRKIE

**T**he children still sing about Rehydran in the streets of Berket Ghatas, this small agricultural village about 40 kilometres southeast of Alexandria in Egypt's Nile Delta:

"Father, father, I am sick,  
Please give me Rehydran.  
Send elder brother running quick,  
Save me if you can."

The playing song has worked its way into the lives of the children as the result of a health education campaign to promote the use of oral rehydration therapy to treat the most critical problem of diarrhea. Diarrheal diseases and associated complications such as dehydration are responsible for almost half the deaths of children under three years of age in Egypt.

Dehydration can develop within a few hours of the onset of diarrhea. A child will die if the loss of fluids reaches about 10 percent of body weight. If the child is to live, treatment to restore fluids and the body's chemical balance must begin in the first six to eight hours of an attack of diarrhea. In the past, rehydration could only be accomplished with intravenous solutions

administered by trained medical staff in a clinic setting. The impossibility of reaching children in rural areas with this sort of sophisticated treatment is shown in the statistics: five million child deaths a year in developing countries due to diarrhea, most of them infants under two years of age.

Oral rehydration therapy is a much simpler approach, a line of first aid that can be delivered when and where it is needed. It consists of a mixture of salt, sugar, bicarbonate of soda, and potassium chloride mixed into clean water and drunk by children or spoonfed to them. (See *Reports* 11(1) April 1982, "The simple solution" on oral rehydration in Trinidad and Tobago.)

In Egypt, the Ministry of Health is adopting a strategy of supplying oral rehydration therapy throughout the country. Egypt has begun to manufacture its own prepackaged oral rehydration mix, under the "trade name" of Rehydran. Currently, Rehydran is available at pharmacies and health centres at very low cost or for free.

But simply providing the means to treat dehydration does not ensure that it will be used, or used properly. Experience has shown that unless communities completely understand and agree to cooperate in health programs, nothing will change.

Diarrhea is so common in developing countries like Egypt that it is not considered a disease. Like getting new teeth or being weaned, it is a normal part of growing up. Convincing people to change their basic conception of something that has been a part of their everyday lives for generations is perhaps the most difficult, but critical, first step in reducing the numbers of infant deaths due to diarrhea.

Planners in Egypt thus sought the most effective way to deploy oral rehydration therapy in the country, and IDRC gave its support to their efforts. In 1980, Dr Sunny Sallam, an epidemiologist at the High Institute of Public Health, University of Alexandria, led a two-year project to develop an effective health education package to accompany the introduction of Rehydran in rural areas of the country.

"We chose two villages of about the same size, Berket Ghatas and Kafala, representative of rural Egypt. They have about 4000 people each," says Dr Sallam. "We did a baseline survey—found out how many families there were with children under three, what the 'normal' incidence of diarrhea is and how it is treated, and what sanitary conditions were like. This information will give us a measure against which we can judge how effective the education program was. If it was successful, we would expect to see the deaths from diarrhea drop, as well as the numbers of diarrheal episodes in Berket Ghatas, the experimental village, compared to Kafala, the control."

In both villages, local volunteers supervised by social health workers visited each family every two weeks. They monitored the incidence of diarrhea, and advised mothers to take their children to health centres in severe cases.

The health centres and pharmacies in both villages were supplied with Rehydran. In Berket Ghatas, the mixture was given a wider distribution. Most of the village variety shops kept a stock, and proved to be very effective distribution points. As most shopkeepers lived on the premises, it meant that—with a little determination and some loud knocking—Rehydran was available at any time of the day or night. People ultimately made good use of these supplies, and some merchants reported selling as many as 25 packets a day during the summer "diarrhea season."

"Kafala was the control. Rehydran was made available as it would be normally, through health centres. In Berket Ghatas, we tried to teach mothers about diarrhea and the importance of early treatment," said Dr Sallam. "We also went into the com-



munity, because it is not just the mothers who decide what to do about diarrhea, it's the fathers, grandparents, local healers, shop owners...the whole community influences the way people think and act."

Along with her principal assistant, Dr Ali Abdel Halim Hasab, and the chief administrator and health education director, Mr Nasr Ali El-Manadili, Dr Sallam mounted a year-long information blitz in Berket Ghatas about diarrhea and how to treat it. They consulted with community leaders to gain their approval and cooperation. Once that was secured, the team really went to market. Literally. Every Wednesday, standing among the carrots and chickens they spoke about diarrhea and how to treat it. Anywhere people gathered, in the clinics, at the washing areas, at schools, Rehydran was there. They even drove through the village lanes broadcasting the message of "Rehydran for your child to avoid the complications of diarrhea."

The climax of the campaign came in May 1981 with the Rehydran festival. Skits, songs, speeches, music, and the appearance of a special guest star—a favourite folksinger—reinforced the message.

The community education program ended with the festival. The team waited to see how much information had been communicated, and how it may have influenced the development of life-preserving knowledge, attitudes, and habits. The findings of a survey taken immediately after the end of the education campaign were compared with those of another survey taken six months later. The image that emerged is like a snapshot of change, taken with statistics.

The knowledge of how to manage diarrhea had improved significantly, while the negative beliefs that diarrhea was somehow natural and not treatable dropped by 64 percent.

All the mothers in Berket Ghatas—compared to only about half in Kafala—had heard of Rehydran. About 40 percent of them reported to the survey that they first learned of the solution through home visits, another 20 percent said they were first advised of it at the health units. Over 70 percent still knew the right proportion of water to mix with the Rehydran. And when asked what sort of treatment they would give their children if sick with diarrhea, 87 percent said Rehydran. Only 12 percent of the mothers in Kafala mentioned Rehydran as a treatment for complications of diarrhea.

Both posters and the festival appeared to be effective aids to health education. Over 90 percent of the mothers questioned understood the poster message of the importance of treatment with the rehydration solution, and almost every household had at least one member attend the festival.

But the bottom line of the statistics is this: Infant deaths due to diarrhea in Berket Ghatas dropped by 68 percent compared to previous years. Even in

Kafala, they were halved. No diarrhea cases in Berket Ghatas were referred to hospital for intravenous therapy.

The change was not easily won. When Rehydran was first introduced, villagers looked on it with some suspicion. It was a plot of the government to control birth rates, they said. Rehydran was really a subtle poison. The team made many public shows of drinking the solution to dispel the rumour. It is dangerous, and might not be safe to use on children, the villagers said. The team had an object lesson drawn from among their own neighbours: Go ask Mrs Aziz, they replied. Her son and daughter were sick with diarrhea. She was afraid to give Rehydran to the son, and so tried it first on her daughter. The daughter lives, the son does not. Go ask Mrs Aziz.

If Egypt were to begin to try to meet the needs for oral rehydration at the village level, it would have to buy or produce some 60 million packets a year. The cost would absorb close to half the national health budget. Effective though it can be, oral rehydration is only a temporary emergency treatment. The long-term solution, Dr Sallam adamantly stresses, is the elimination of diarrhea through improved sanitation facilities and intensified health education. But as long as there is a need for immediate rehydration, Rehydran must serve.

The object of Dr Sallam's research was to find the precise combination of

education and technology that makes oral rehydration effective. If Egypt is to expand and promote the use of Rehydran, it has no choice but to do it in a way that will make the best use of limited health resources. Dr Sallam's research will ultimately influence the decisions made about managing those resources in providing oral rehydration.

But it has also had a more immediate effect in Berket Ghatas, one from which she and Dr Hasab draw hope for the future. As Dr Hasab puts it: "Research is something you take from people. You can fold up the results on a piece of paper and put them in your pocket and walk away. You know, this research has left something with this village, changed it in ways you cannot really understand unless you understand Egypt. Before, people did not even think of diarrhea as a disease, or that it was not natural for children to die from it. People did not use health services. They did not bring their children to be cured. They brought them in to die. Better to die in a clinic than in the home. Better the mother's grief fills the clinic and not the home.

"But now, we have turned mothers into doctors. They are treating their children. They buy Rehydran like aspirin, as medicine. This change is more important than you can imagine. I think to have made this change in people's lives is an accomplishment." □

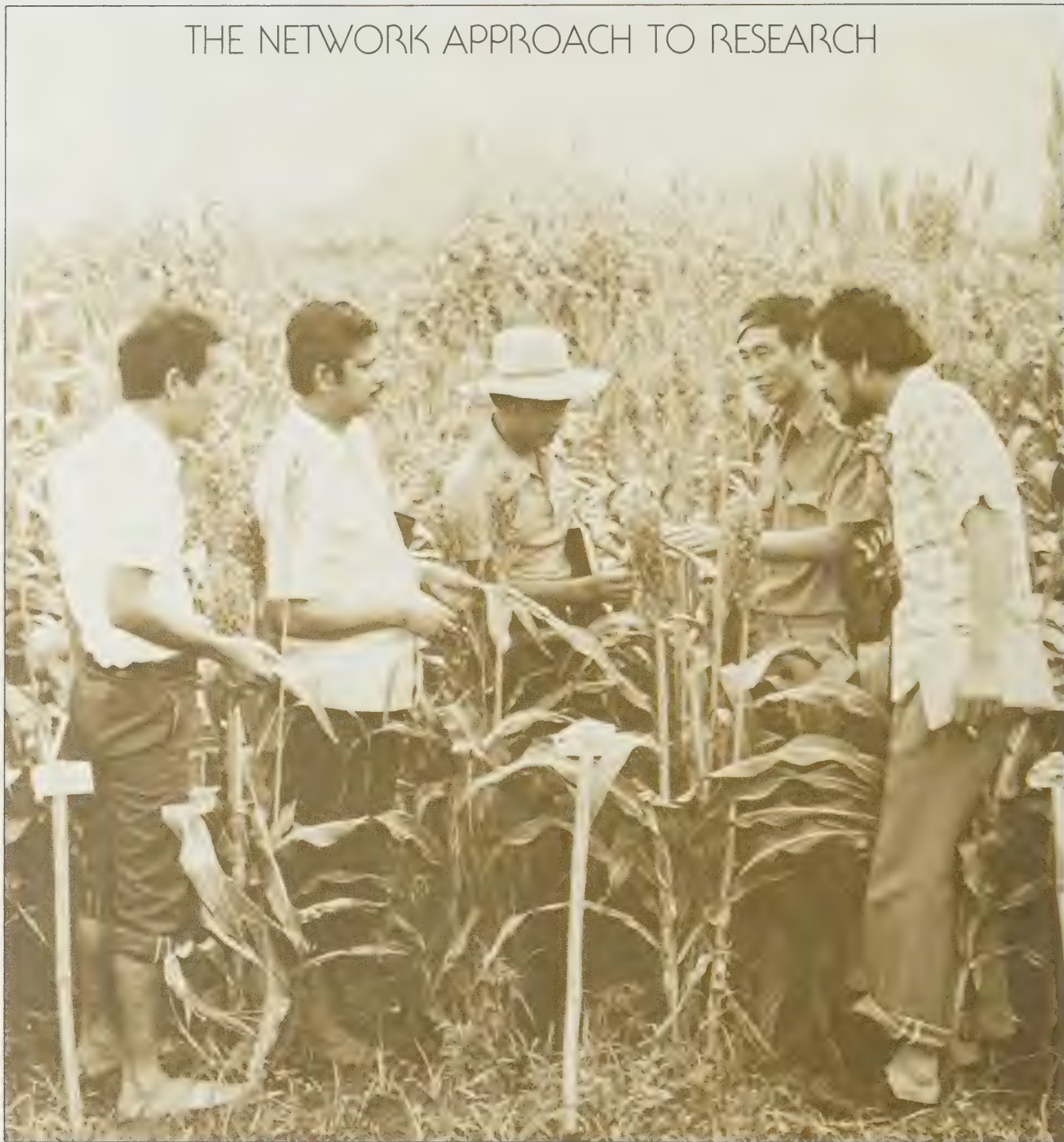


*Berket Ghatas, focus of an intensive health education campaign.*



# MUTUAL AID

## THE NETWORK APPROACH TO RESEARCH



*Networks: an inexpensive catalyst for research and an opportunity for isolated scientists to work together on common concerns.*

**D**eveloping countries are labouring under a double burden: enormous problems of increasing intensity and extent, and a weak (or sometimes nonexistent) capacity to solve them. Yet, while the political leaders of the North try to instill in their peoples the idea of the interdependence of nations and the need to mount a united attack on global problems, the South is acting on them. Third

World researchers, aided in their efforts by institutions like the IDRC, are putting interdependence into practice in a mutual aid and development model by creating networks of research projects addressing their most urgent concerns.

A network may be two or three projects or a number of institutions. It may exist within a country, within a larger geographic region, or as a

global linkage across continents. Whatever the constituents, a network is created to increase the effectiveness of research.

The reasons may vary from one group of projects to another, but the basic principle is to bring national and regional research institutions out of isolation and widen their resource bases and range of activities. Although forming networks entails certain ad-



ditional coordination costs, it makes possible training and experimental programs in which Third World researchers, working on the same problem or in the same discipline, get together to acquire new knowledge and new techniques, develop a common methodology, and place local problems in their true regional or even global context. However, what does the new cohesiveness, arising from a research network involving ten or twenty institutions, actually do for the individual countries involved?

Researchers in the developing nations have often been trained in industrialized countries, and are accustomed to using state-of-the-art equipment that is nonexistent in most of the countries to which they return to work. A way of counterbalancing the resulting frustration is to bring together researchers who work under the same conditions and have developed means of coping with them. Of course, great differences in means separate some countries. A Haitian agronomist, for example, functions in a different context than a colleague in Brazil. However, despite the differences, it is infinitely more desirable to establish a research network that uses the available resources of a region and responds to the national priorities expressed by each of the participating institutions. Moreover, the differences in experience, and even in training, may benefit the countries with weaker research infrastructures, giving their men and women a chance to observe the progress that has been made and to take advantage of new techniques. This can be a stimulus toward more rapid progress.

Another consideration is that, if a particular field of research is relatively new, the creation of a project network will win additional credibility for the subject. Providing the results can be easily assimilated by participating governments and are skillfully disseminated, a network linkage will promote earlier application of the research than would occur if the institutions each tried to effect the same results in isolation. This was the experience provided by two IDRC projects — one involving cassava in Brazil, and the other forestry in Senegal — that attracted the attention of development planners in these countries even before they produced tangible results, because of the "network effect."

## THE PITFALLS

In a report prepared for IDRC's Office of Planning and Evaluation, consultant Barry Nestel points out that the countries most likely to receive aid to establish a research project network are precisely those countries that perhaps have the least urgent need of it. The most highly elaborated and advanced institutions will thus enjoy the most credibility and receive resources necessary for the development of a research strategy tailored to the bureaucratic ways of the donor institu-

tions. Dr Nestel notes there is some fear that aid institutions are encouraging the creation of a class of "celebrity" researchers, who no longer have the time to read or think about their work because they are too busy flying from one international meeting to another, and who merely lend their names to projects carried out by teams of subordinates.

Although it is healthy and desirable for researchers of different nationalities to come together to develop methods, compare techniques and results, and prepare joint undertakings, some difficulties of communication have arisen in project networks that bring together researchers from continents far removed from one another, not just geographically, but also in their philosophies and culture.

When a research project network is created, on the initiative of a national research institution, an aid institution, or an international association of research centres, objectives are set and priorities established for work, training, dissemination of results, and so on. All of these elements will take shape harmoniously and efficiently if proper coordination is provided. Cohesiveness, efficiency, and the equitable sharing of available resources are all essential elements of such a network. Proper coordination will provide directors with a great deal of experience in research management, an aspect of research activity that ensures that institutions grow in a manner that best serves their target populations, and not in accordance with shortsighted, vaguely defined priorities.

## LARGE AND SMALL NETWORKS

Networks vary in size. The Consultative Group on International Agricultural Research (CGIAR) includes several networks. The CGIAR feels that they are a valuable contribution to the research activities of countries and international research centres. When national research programs are well established — as in Brazil and India — international centres enjoy a greater potential for collaboration and documentation.

The International Rice Research Institute (IRRI) has set up several international networks, whose operations it coordinates. The IRTIP (International Rice Testing Program) makes it possible to evaluate elite varieties, breeding lines and parental materials from IRRI and national institutes in 12 yield and screening nurseries around the world. INSFFER (the International Network for Soil Fertility and Fertilizer Efficiency for Rice) affords researchers from a dozen countries the opportunity to carry out a systematic evaluation of various formulations and application methods for nitrogen, sulphur, and other nutrients.

The CGIAR believes that networks such as these act as inexpensive catalysts and are able to undertake scientific investigations with a degree

of flexibility in terms of sequence and volume of research activity. In many cases, it is preferable for a research network to work in association with a fairly large centre capable of providing medium- and long-term financial resources and training.

## SCIENTIFIC UNDERDEVELOPMENT

A number of developing countries lack research infrastructures equal to the problems they face. The flexible and collegial structures resulting from research networks may greatly increase the potential of teams in regional and national institutions. But this is true only if training activities and the efforts of the more advanced members of the networks focus on the needs and growth potential of countries where there are fewer institutions and research activities. The types of project networks promoted by the IDRC are aimed at making such contributions to developing countries, aiding them in strengthening their own capacity to find their own solutions to the problems they face.

Some examples of the networks of research interest that IDRC has assisted follow.

**Latin-American Research Program in Human Reproduction (PLAMIRH)** Involving institutions in 11 Latin American countries, this network was set up with the participation of the Ford Foundation and the IDRC. It has helped young researchers interested in the biology of human reproduction to progress and develop innovative ideas, especially in applied research, that result in more productive research activities in this field.

**Science and Technology Policy Instruments (STPI) Project** The purpose of this project network was to provide government decision-makers with information concerning the effectiveness of various policy instruments that might promote the use of science and technology in industrial development. The two phases of the project brought together participants from South Korea, Mexico, Venezuela, Yugoslavia, Brazil, Argentina, Colombia, Peru, Egypt, and Nigeria.

**Southeast Asia cooperative post-harvest research and development program** Housed in the offices of the Southeast Asia Regional Centre for Graduate Studies and Research in Agriculture (SEARCA), this network included research institutes in Singapore, Indonesia, Thailand, the Philippines, and Malaysia. The goals were to promote better exchanges and closer cooperation between teams of researchers working on similar problems relating to postharvest systems, and to encourage wider support for research activities of this type. SEARCA assumed the bulk of the coordinating and technical training duties. In June 1980, the project network embarked on a new phase of work, that will continue at least until the summer of 1983. □



## THE CHALLENGE OF OUR TIMES

ROBERT S. McNAMARA

**B**arbara Ward applied to the Third World the central lesson she learned in her early work in the Great Depression: the lesson that "the magic of the marketplace," while necessary to alleviate poverty and to build economic health out of national interdependence, is not sufficient to do so; that rich and poor states, as well as individuals, are "members one of another" and not islands. She explained, expanded and expounded this, until yesterday's heresy became today's conventional wisdom.

But the conventional wisdom is vulnerable. The academic who strives to seem original, or the politician who seeks to intellectualize an appeal to self-interest, now tends to decry aid, to blame the poor for their poverty, and to argue that the rich can safely ignore their interests. Those claims are merely selfish and ignorant.

In the 1960s and 1970s,

the world began to weave a complex skein of arrangements for trade liberalization, capital flows, and food security. This skein is in danger of being unravelled by a series of experiments — in aid-cutting, in fiscal management, in mercantilism, in drastic reallocation of functions between public and private sectors, and in much else. But many of the remaining experiments, too, have little intellectual content. They appeal to the short-run budgetary concerns of some governments in rich countries. They are, taken together, appallingly perilous.

In two areas, especially — the survival of the absolute poor, especially in Africa, and the stability of the international economic system — these almost random experimenters could pick and pick at the skein until they unravel the fabric of the world economy.

If the interdependent world system continues to

be eroded by contradictory fiscal and monetary policies, the present worldwide stagnation could continue indefinitely, with short upturns frustrated by self-renewing downturns. Even if such worldwide stagnation is avoided, if policies on food, trade, and capital flows do not give special recognition to the needs of the poorest, the 1980s will see massive economic distress in particular regions — probably in Asia, and almost certainly in Africa.

We can prevent these dangers, but only by swift action.

### ECONOMIC INTERDEPENDENCE

What is the evidence for claims that national economies depend on each other? Suppose the developed "market" economies belie their description and seek to safeguard jobs by protecting against the manufactured and semi-manufactured exports of the non-OPEC developing countries. In 1980 these exports amounted to U.S. \$64 billion, but imports from the developed countries were about U.S. \$154 billion. A "trade war," with the developing country victims retaliating by raising their own trade barriers, would lead to the developed countries losing more jobs as exports fell than they could gain from keeping imports out. Even without retaliation, the loss of an efficient source of export earnings could compel Third World countries to curtail imports from developed countries.

Each piece of protection, each subsidy to a "threatened" industry, may do damage, initially, to only one exporter. This exporter, however, must restore equilibrium: Contract the domestic economy here, postpone repayment of a debt there,

cancel (or protect against) an import from somewhere else. Here, there, and somewhere else, in turn, find their spending power cut, and pass on the harm by reducing demand elsewhere. Everywhere, supply is made less efficient as economies of scale are lost.

The cumulative, many-country, many-round harm done by protectionism is complex and subtle. But the total effect of such measures, involving secondary spinoffs and retaliatory moves, is vast.

A better example, potentially all too dramatic, concerns the interdependent world system of capital flows. Borrowing and lending transactions can in their totality make it harder for the system to avoid cumulative recessions, or to reverse them once they begin.

The real risk comes not so much from default or even rescheduling — though 26 developing countries were in arrears at end-1980 for a total of U.S. \$5.5 billion — as from the steps taken to prevent it. Banks begin to lend to risky cases at shorter term, at higher or variable interest, or ultimately not at all. Borrowing countries deflate or raise protective barriers to cut imports. All this erodes the credit base, as surely as a default itself would.

At the end of 1981, oil-importing developing countries owed U.S. \$400 billion and were spending one-fifth of their export earnings to service debt. All of these countries are vulnerable on the trade front: to a fall in commodity prices; to recession in their markets; or to protection affecting their manufactured exports.

In this environment, an unexpected, uninsured non-repayment by any borrower would be likely to cause specific banks,



mostly in the U.S.A., to reduce lending by a multiple of the non-repayment. Who suffers directly? The answer is clear: the weakest borrowers, the customers believed by the bank's board to be risky.

The increasing risks have already restrained bank lending. Some would attribute part of the serious slowdown in the world economic activity to this restraint. Developing countries have had to respond to reduced real inflows of capital by contracting imports, thereby reducing the risk of rescheduling, but at the cost of increasing other parties' risks and deflating the world economy.

THE PERSISTENCE OF ABSOLUTE POVERTY

It is the growing interdependence of nations, political as well as economic, that causes the poverty problem to be increasingly dangerous politically and increasingly unacceptable morally. Research, private investment, and concessional assistance in support of production that involves work for the poorest is a top priority for the 1980s. Yet it is exactly this sort of activity that is most seriously threatened.

Concessional assistance paid for one-fifth of the low-income countries' gross investment in 1979 and has helped many governments to give more attention to the needs of the poor, especially to food production on small farms and to upgrading urban slums. Such lending has shown excellent economic returns. Nevertheless, it must be largely financed by low-interest money because very few low-income countries can be expected to meet harder terms. Therefore, the assault on world poverty is under grave threat if the volume of low-

interest loans and grants to the poorest countries does not grow.

In real terms, aid to the poorer developing countries rose by 65 percent between 1970-72 and 1974-76. Since then, it has fallen by about five percent. Meanwhile, the real value of aid to middle-income developing countries more than doubled.

Recent disbursements — and, even more, recent commitments — reflect a grim political reality. Commitments of aid by all donors, OECD and OPEC combined, fell by eight percent in real terms between 1977 and 1980. And those to the 1200 million people in the low-income countries, other than the Least Developed Countries, fell by an appalling 28 percent. Meanwhile, the share of the multilateral agencies in the aid disbursed by the OECD countries dropped from 32 to 28 percent. In 1981, the Official Development Assistance (ODA) disbursed by OECD fell by eight percent in real terms. At present the likely prospect for aid in the 1980s, and especially for multilateral aid, is not good. If that prospect is realized, the poorest people in the poorest countries will be the losers.

These, then, are two great challenges of our time: to substantially reduce absolute poverty, and to construct relations of interdependence, a world economy, that stabilize growth and distribute its benefits widely.

In an environment of growth, poverty can be effectively attacked, but such attacks, so far, have failed to improve the incomes or productivity of some of the poorest of the poor on whom absolute need and especially caloric risk are concentrated.

With respect to development, the main lesson about interdependence is that when trade is restricted and capital flows are constrained, for whatever reason, the repayment capacity of Third World borrowers is endangered. This threatens the capacity of lenders to support high and rising levels of activity worldwide.

THREE RESPONSES

There are three ways to respond to these challenges: to do less of whatever seems dangerous or inadequate; to apply more of the medicine that has, after all, achieved a considerable advance over the past two decades; or to modify policies in ways that learn from both successes and failures.

The last approach sounds obvious, but it is in fact difficult and unpopular.

Only the hardest option is feasible in the medium term: gradual expansion of private bank lending to developing countries as well as a dramatic improvement in its distribution and quality through the rapid buildup of supervision linked to lender-of-last-resort facilities. Concessional and other long-term lending will also need to form a growing proportion of total capital flows.

A similar undogmatic approach is needed in the attack on world poverty. It's fashionable to argue that you can't cure poverty by throwing money at it. Certainly handouts and well-meaning but badly planned projects won't help. However, more resources are a necessary condition for bringing the poorest into the development process.

With poverty as with interdependence we can meet the problems, fill the gaps, cut the risks. But we

cannot do so with unimaginative expansions of aid, and only partly satisfactory, approaches.

Still less can we succeed by drastic cutbacks, or by a retreat into reliance upon pure self-interested profit-seeking and niggardly private charity.

The attacks on poverty and instability to date have achieved partial success. But to apply exactly the same strategies to the newly revealed problems — to the persistent deprivation of the very poorest, to the new risks of default, to widespread economic stagnation — would be unwise. And to abandon the attack altogether would be dangerous and self-defeating. Markets can work, and can be trusted, but not unless public agencies — national and international — create the conditions under which markets can operate in a stable manner, and in which the poorest can reasonably hope to benefit from participation in them.

Of one thing we can be sure: the magnitude of the problems, and the inability of any single nation to solve them by its own actions, requires greater communications among nations. In late 1981, the first Summit Meeting among leaders of rich and poor countries took place. More such meetings are needed. They will not lead to instantaneous solutions to problems. But they will expand understanding of common needs and of the potential for action that will benefit all. □

*Robert S. McNamara is former president of the World Bank. This article is excerpted from Mr McNamara's lecture, Economic interdependence and global poverty: the challenge of our times, delivered in Baltimore, U.S.A., July 1982, as the First Barbara Ward Memorial Lecture.*



Information is essential for national development. But the exponential growth of information in recent years has surpassed the ability of individuals and institutions to cope with it. How to tap this wealth of information in a systematic way so that it can be applied to increase knowledge, guide research, and formulate policy has become one of the most pressing problems of the 1980s.

Libraries are the traditional repositories of knowledge. For centuries librarians have pursued the unattainable goal of gathering, in a single library, all the resources necessary for information and research in their country or institution. Once a fond hope, this has become an impossible dream. If libraries are to continue to meet the demands of their users, increased cooperation and resource-sharing are vital.

The need to share resources in order to cope with the increased flow of information is true in all countries, but is most acute in developing countries where resources are limited. Among the many priorities, information services seldom rate very highly. This means that library budgets are correspondingly low.

The rapid escalation in the price of materials, particularly periodicals, also means that already meagre library budgets lose purchasing power from year to year. In addition, exchange control regulations in many countries make the purchase of foreign materials very difficult. The physical collection of documents is hindered by the lack of an efficient book trade, and by gaps and delays in reporting new publications in national bibliographies.

Lack of facilities for rapid communication among national libraries and documentation centres, inefficient equipment for producing photocopies and microforms, poor telephone and postal services, and restrictive customs regulations also hamper access and exchange of information.

Given these problems, resource-sharing, although not a panacea, offers attractive benefits. Just such a strategy is being actively pursued in Southeast Asia.

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*Regional cooperation: using technological tools, such as computerized cataloguing, to extract the most from shared resources.*

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# SHARING KNOWLEDGE

MICHAEL GRAHAM

## LIBRARY LINKAGE IN SOUTHEAST ASIA





At its most basic, resource-sharing implies the sharing of materials by libraries. To achieve this effectively, various programs must be undertaken cooperatively at both regional and international levels. To increase the range of materials available, there must also be cooperation in acquisitions, because no single library can afford to acquire everything that has been published. Bibliographic access must be provided to collections in other institutions. This frequently involves the production of union catalogues listing together diverse collections and a sharing of the labour of cataloguing. An efficient document delivery system must also be developed. Personnel must be trained and mechanisms developed to improve resource-sharing programs and the ability to promptly respond to requests for information.

The foundation of such cooperation within the ASEAN community — Indonesia, Malaysia, the Philippines, Singapore, and Thailand — has existed since 1970 in a regional professional body for librarians and information specialists, the Congress of Southeast Asian Librarians (CONSAL). The congress fosters greater contact between groups and individuals working in the information field and provides an ideal forum for promoting regional cooperation.

Considerable progress has already been made with the compilation of various types of resource inventories. Numerous directories of regional information resources have been published by a number of national and international organizations. National bibliographies and union lists of serials are generated in all countries, generally using computer-based methods, and attempts to consolidate them at a regional level are being undertaken.

Projects aimed at increasing cataloguing efficiency by using computerized systems have been started at several centres such as the Universiti Sains Malaysia and the National University of Singapore. These projects use existing MARC (Machine Readable Catalogue) data bases and involve the building up of local MARC data bases. Though started initially at limited local levels, such systems when operational will be extended to many libraries, resulting in large-scale cooperative efforts in Southeast Asia.

The use of computers for cataloguing, resources inventories, provision of selective dissemination of information services, and data base management is obviously an area where cooperation is most desirable. Consultancies, workshops and seminars, regional projects, staff training, and exchange agreements have already moved congress members toward this end.

Repackaging and disseminating

information in Southeast Asia has been improved by some sharing of responsibilities and work, mostly informal, between libraries and documentation centres. General coverage of national outputs is provided to a large extent by the publication of abstracting journals and bibliographical lists produced at national levels. Information on several areas of high priority for the region has been handled by regional cooperative networks such as TECHNUNET (Asian Network for Industrial Technology Information and Extension), AIBA (Agriculture Information Bank for Asia), and SEAMIC (Southeast Asian Medical Information Center).

Institutions such as the British Library (Lending Division), the U.S. Library of Congress, and the Australian National Library can provide most of the information pertaining to the developed world. But because comprehensive national bibliographies are still lacking in many developing nations, trying to obtain literature produced in



*Mrs Hedwig Anuar, regional coordinator.*

neighbouring countries is often the greatest problem for their libraries. A promising approach to meeting the demand for regional literature is to strengthen the national libraries and to increase their capabilities to help each other.

An important boost to such regional information-sharing was given in 1978 when, with government endorsements, the Consortium of National Libraries and Documentation Centres of Southeast Asia (NLDC-SEA) was established. This group, begun with the financial assistance of IDRC, includes the National Libraries of Malaysia, the Philippines, Singapore, and Thailand, and the National Documentation Center of Indonesia.

The NLDC-SEA strives to provide each library in the group with access to the collections of the others. It does this by facilitating the exchange of documents through interlibrary loans, provision of photocopies and microforms, and by providing assistance and coordination of acquisitions. The

consortium has also been able to establish effective communication channels among member institutions by the use of telex facilities.

The consortium also aims to promote the prompt recording of national imprints in national bibliographies in accordance with international standards. The format used will facilitate the creation of a regional magnetic tape service to improve bibliographic control and the availability of library materials within the region.

Each of the NLDC-SEA national members is the centre of its own national library network. The consortium thus potentially links most of the libraries and information centres in the region. A liaison officer in each country assures the day-to-day work of the consortium, and the regional coordinator, Mrs Hedwig Anuar, Director of the National Library of Singapore, effects the administration of the consortium.

During 1980, the consortium attempted to establish a computerized regional bibliography of national holdings. Two consultants from the Universiti Sains Malaysia surveyed national bibliographies in Malaysia, Indonesia, the Philippines, Thailand, and Singapore in mid-1980, and presented their report and recommendations to the consortium in February 1981.

Following subsequent discussions among the consortium's five member countries, the consortium, with IDRC funding, decided to produce a pilot issue of a regional computerized selective bibliography. The Universiti Sains Malaysia Library will serve as the regional processing centre and the bibliography will be produced using the SEAMARC format. National bibliographers in each member country will contribute entries on a quarterly basis. The number of entries is expected to grow annually at a rate of 10 percent, keeping pace with the publishing output of each country.

The implementation of this regional computerized bibliography (SEAPRINT) will help considerably to further information-sharing on a regional basis. The resulting speedier listing of indigenous publications will facilitate the production of national bibliographies. Only one source need be consulted to obtain information on important publications in member countries. The acquisition of titles from regional bibliographies will also be easier.

The development of a regional bibliographic data base and its exchange will greatly assist the consortium institutions as well as other libraries in the member countries. By enabling subject searches and subject bibliographies to be done on a regional instead of a country basis, awareness and use of indigenous material will increase. The creation of the regional SEAMARC



format will also encourage standardization of the national MARC formats. Staff in the participating libraries will gain experience in running a technologically sophisticated system, and the spirit of cooperation that already exists in the region will be strengthened.

The member institutions of the consortium — except for the national libraries of the Philippines and

Thailand — are young institutions. The introduction of the consortium services has revealed gaps in their collections of national imprints. While all of them are building up and improving these collections, there are usually other, older, research libraries in each country that have more complete collections of national literature. The cooperation and participation of such libraries in the

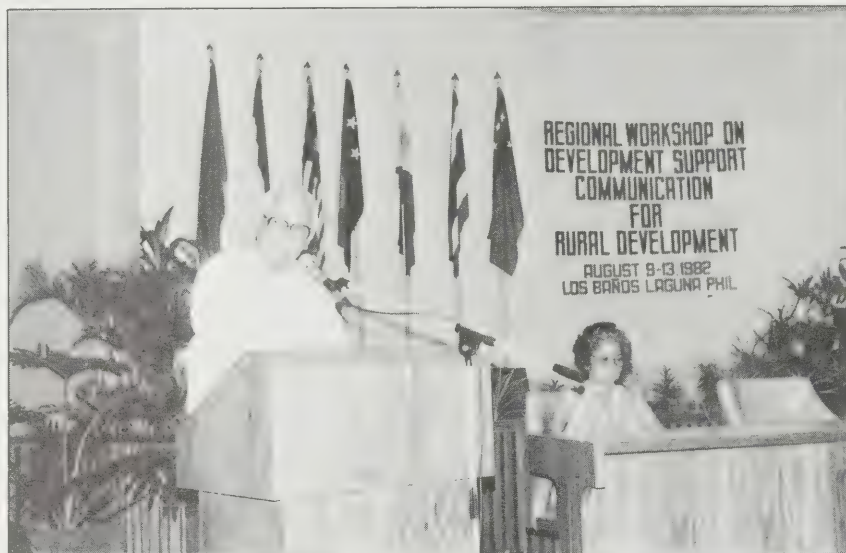
work of the consortium is essential to its success. The national libraries of the Philippines and Thailand have led the way by negotiating agreements with a number of such libraries to participate in interlibrary loans and acquisitions requested by other countries. The national libraries can duplicate the borrowed document, thus filling gaps in their collections.

The consortium has not yet been able to devote much attention to initiating action to reduce barriers to the free flow of library materials within the region. This cannot be attempted without seeking the cooperation of other concerned bodies in both the public and private sectors. Because it involves changes in government policies and legislation in the countries concerned, it is likely to be the most difficult of the consortium's tasks. The problem will be tackled in cooperation with such bodies as the UNESCO Regional Office for Culture and Book Development in Asia, which has initiated a study of postal and freight charges for books and other printed matter, as well as with national book development councils in the region.

Obstacles — human, social, cultural, political, technical, and financial — still remain to the efficient coordination of sharing of resources in Southeast Asia. Individualism and nationalism tend to limit efforts to the local level. Cultural differences and the variety of languages used in the region aggravate the problem. But most of the obstacles to the development of national and regional information systems derive from the scarcity of financial resources that prevents increasing acquisitions, improving facilities and equipment, training and keeping qualified personnel, and implementing modern methods and cooperative ventures.

Overcoming these obstacles will require increased regional consciousness. Decision-makers and users will need to be convinced that improving information facilities is an important component of development, requiring increased financial resources, and that barriers to information flow have to be eliminated. Funding agencies must be persuaded to increase their financial and technical support and to adopt more realistic and relevant policies.

But despite these obstacles, the prospects for coordination and development of information activities in Southeast Asia are good. Appropriate infrastructures are quickly developing and the will to cooperate exists. If sufficient resources are made available, spectacular improvements in the coordination of information services will occur in the years to come in Southeast Asia and may serve as a model for other regions. □



*Dr Joseph Madamba, Director-General of SEARCA: communication to trigger development.*

## COMMUNICATIONS FOR DEVELOPMENT

A strange dichotomy exists in many developing countries. On the one hand, research output has reached such a prolific level as to prompt the establishment of computerized information storage and retrieval systems. On the other hand, vast numbers of rural families continue to live in absolute poverty and earn a meagre livelihood because they have not yet benefited from the fruits of research, ostensibly carried out on their behalf.

The reason a significant number of people are still not affected or involved in the development process is often due to the ineffective communication of the results of research. How this communication process could be improved was the focus of a regional workshop on development support communications, held at the Southeast Asia Regional Center for Graduate Study and Research in Agriculture (SEARCA) in Los Baños, Philippines, in August 1982. The workshop attracted delegates from Indonesia, Malaysia, Thailand, the Philippines, Western Samoa, Bangladesh, and several international and regional institutions and organizations active in the region.

In his opening address, the Minister of Education and Culture of the Republic of the Philippines, Dr O.D. Corpuz, stressed that any development support program

must be designed specifically to serve the practical needs of extension services and the farmers who are their clients.

Efforts to implement such practical programs are currently hampered by a lack of trained personnel. During the workshop, the participants attempted to identify the level of training needed in development support communication and to assess the capability to provide this training in their countries. They agreed that there was a real lack of trained people in the region and that future training should emphasize short-term specialized courses on technical skills such as writing, editing, and producing extension materials; degree programs at the master's and doctoral levels; and internships and consultancies based on regional collaboration.

However, the preliminary survey work undertaken at SEARCA needs to be augmented. There is a pressing need for more detailed information about country needs and capabilities to provide the specific types of training that will be required in each country to mount effective programs to support development efforts. This is an important area for future emphasis by governments and donors and one that is essential if development efforts are to have a significant impact on the lives of rural people.



*Landsat satellite over Africa:  
keeping an eye on  
development (NASA photo).*

*Satellite  
remote sensing  
comes to Africa*

# A SENSE OF PLACE

LUC-ADOLPHE TIAO

**"R**emote sensing is not a luxury," Mr Sawadogo, a young Upper Volta technician employed at the Ouagadougou Regional Remote Sensing Centre (CRTO), firmly asserts. "We cannot do without this technology, it is essential for the study of our natural resources."

Development efforts have little chance of success unless planners have a sufficient knowledge of existing conditions — the extent of desert, forests, surface water, cultivated lands, and so on — from which to proceed. These

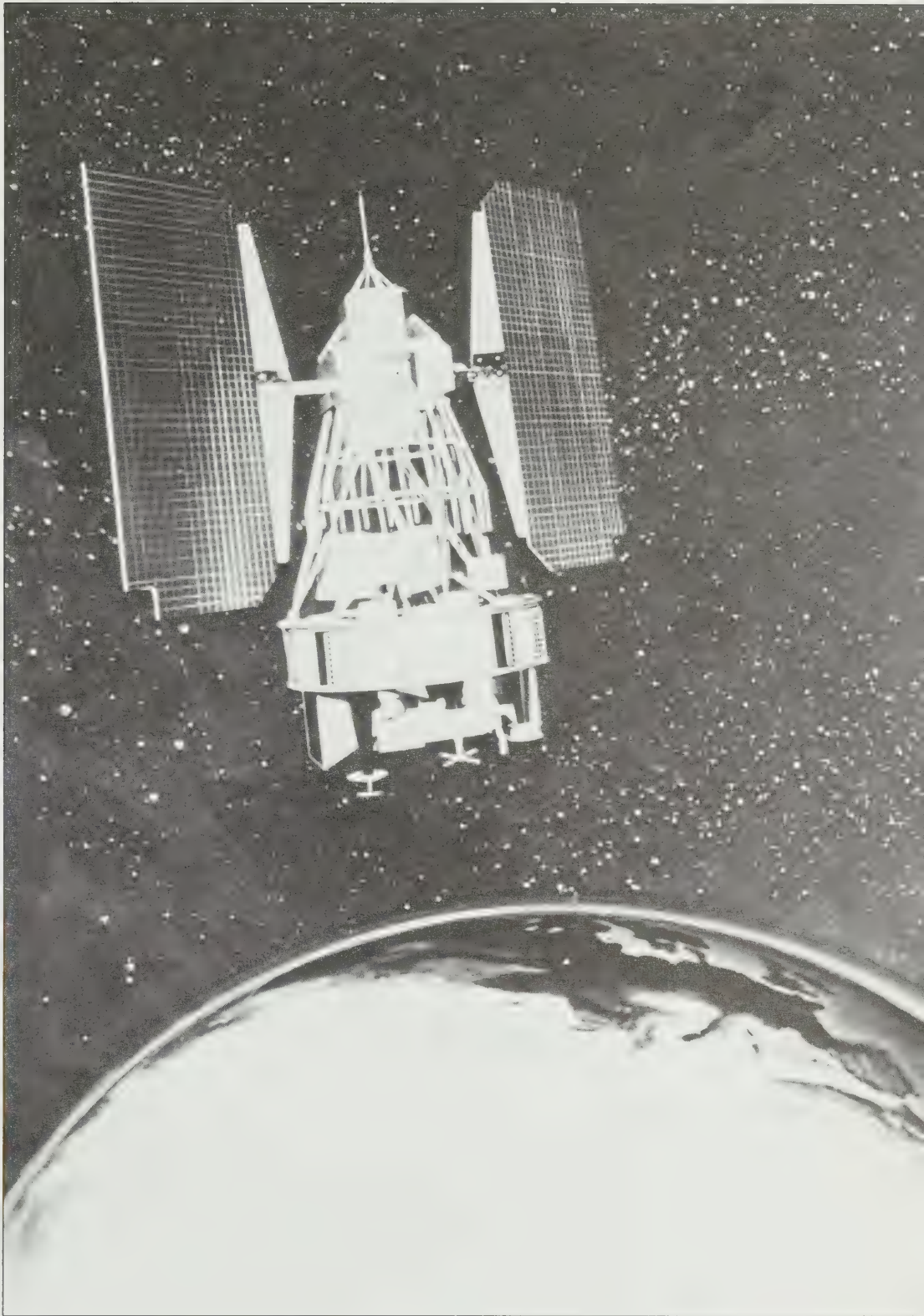
conditions must be clearly indicated on maps, but revising the maps can cost a fortune when the data must be collected time and time again through ground or aerial surveys.

The launching in 1971 of Landsat 1, the first remote sensing satellite for terrestrial resource observation, by the U.S. National Aeronautics and Space Administration (NASA), provided a

solution. The information picked up by this satellite, and others that followed, is transmitted to satellite ground stations, recorded on magnetic tapes and processed to produce images. The shades and colours of the images are interpreted to give detailed information on the presence of water, vegetation, land use, etc., in the area surveyed.

Remote sensing is indeed a very valuable tool,

but its use requires training and equipment. It is for this reason that CRTO was created in 1978, thus launching Africa into the space age. During the previous three years, the entire continent had seen a remarkable development in cooperative networks and specialized research and remote sensing institutions. Though all interested countries set up their own national commissions or





application centres, it was also evident that they would have to adopt some means of regional cooperation if the technology was to be used in an effective and equitable way.

During this period the United Nations Economic Commission for Africa began preliminary work and, early in 1976, organized a regional mission to carefully study all of Africa's needs and priorities for resource inventories from remote sensing. Its report first outlined the means and conditions required for a coherent long-term program, and then formulated various recommendations. Notable among these was the formation of an African remote sensing council and the establishment of five specialized regional centres.

CRTO was the first of these centres. Others are planned for Nairobi, Kenya, and Kinshasa, Zaire, for reception, processing, and dissemination of images. There will also be centres at Ile-Ife, Nigeria, and in Cairo, Egypt, for processing and training.

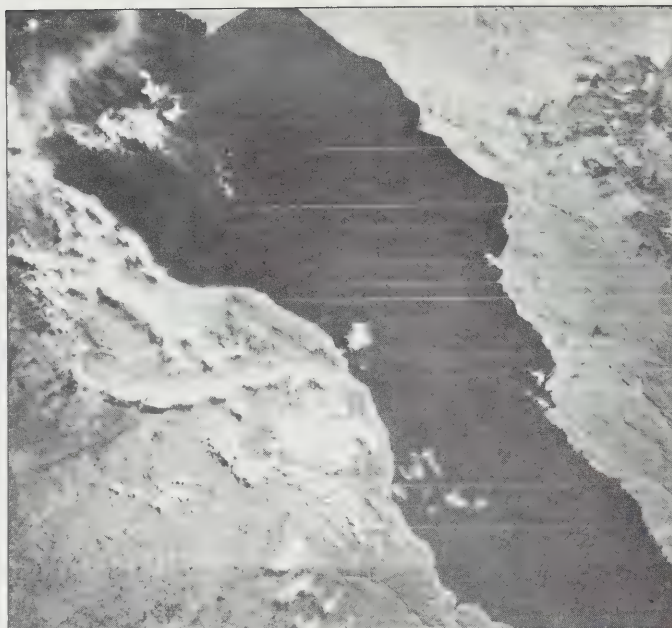
Ouagadougou, the capital of Upper Volta, was selected as the site of the first station because of its location, which enables it to serve the countries within a 3000 km radius. Thirty countries lie within this radius, 24 of which will receive full coverage. The others will receive partial coverage. To date, 11 countries have become members of the CRTO: Bénin, Cameroon, the Congo, Ivory Coast, Ghana, Guinea, Upper Volta, Mauritania, Niger, Senegal, and Sierra Leone.

The launching, in 1984, of the French satellite "Spot" will reinforce this coverage capacity. Installation of a satellite ground station in Ouagadougou is planned for the same year.

During its first years of activity, the CRTO's activities were centred on training, applications of the data, and the distribution of remote sensing images. These activities constitute the very foundation of exchange and co-operation with researchers and users in West Africa.

Training is the most important aspect of CRTO's work. According to Mr Yaya Koussoube, a CRTO trainer, about 120 to 130 trainees have come to the centre since 1978. The three-to-six-month courses there are organized three times yearly, with 10 to 15 participants per session. The purpose of the courses, which consist of initiation, training, or project work, is to provide technicians, engineers, and researchers with the knowledge required to effectively use satellite data.

The CRTO is now placing more and more emphasis on assistance to users, that is, on helping the countries to use the data. This is supported by applied research projects, ranging from studies



*Satellite data transformed into an image: a map of natural resources (NASA photo).*

on how to use remote sensing to gain information about flooding, to preparing thematic maps of vegetation cover.

Finally, the distribution of remote sensing images, reproduced in various types and sizes depending on the need, is an important component of the Centre's activities. The selection and production of these images are tailor-made to the analyses planned and required.

The most significant demonstration projects have been carried out in Upper Volta. For example, at the request of the Episcopal Conference of Upper Volta, the Centre studied changes in vegetation and the extension of cultivation over the 20-year period 1955-1975 in the central to northwest area of the country. An important conclusion was reached in the study: the perimeters of the cultivated areas have clearly expanded from 1955 to 1975. This expansion is due to a movement away from the areas under cultivation in 1955. Now abandoned, these areas have deteriorated, as is shown on the images by the impoverished vegetation.

According to CRTO experts, remote sensing has proven to be a very effective tool in assessing the changes of bodies of water by examining their surfaces. A study of this type has made it possible to produce an accurate map of the region's various water bodies. This map will serve as a basic document for the National Bureau of Dams and Irrigation.

Working on behalf of a public works company, the CRTO has even shown that special remote sensing can be used in road repair. A study has made it possible to obtain very rapidly and at a relatively low cost important information: the hydrographic system, areas susceptible to flooding, the location of industrial water for compacting, and quarries.

The potential of remote sensing is thus enormous. According to Mr

Koussoube, it saves time and money compared to aerial surveys. However, he does acknowledge that aerial surveys are more accurate, as aircraft can fly just above ground. The Landsat satellites orbit at an altitude of over 900 km, circling the earth every 18 days. Each image of the ground represents a surface area of about 34 000 km<sup>2</sup>.

With the Spot satellite, an image of the same region will be available every two to five days on average, thus making it possible to follow certain phenomena with greater accuracy. In addition, Spot will have greater resolution. Each of its images, ranging from 60 to 80 km<sup>2</sup>, will consist of 36 million "dots." Each dot will correspond to a square of 10 to 20 metres at ground level. It will therefore be

possible to discern small farms and the plots on which different crops are grown.

In June 1982 a regional seminar was held in Ouagadougou on the interpretation of satellite imagery as it will be provided by the French Spot. The delegates from over 24 African countries were given some firsthand experience with remote sensing and its applications.

But despite the evidence of the usefulness of remote sensing, many African countries have misgivings about this form of high technology. Some feel that it might be used for political ends. Others are uncertain as to whether studies conducted using satellite data will be cost effective. But ultimately, it is the lack of qualified personnel that constrains widespread use of satellite data on the continent.

To help solve this last problem, IDRC is financing a project at CRTO to ensure scientific cooperation in applied remote sensing research in West Africa. A research advisor is assisting CRTO to fulfill its role as a centre of excellence for training and applied work. The project also aims to develop methods of remote sensing analysis and application that will contribute in a practical way to the preparation and dissemination of studies on renewable natural resources, and to help African researchers and trainees carry out effectively the various studies required by the governments. Thus the professional relationships between the various users in West Africa and the CRTO will be enhanced.

It is expected that, through the activities of the CRTO and other regional centres, the use of remote sensing will increase considerably in Africa in the years to come. □

*Luc-Adolphe Tiao is head of national news at the Carrefour africain, Ouagadougou, Upper Volta.*



**Devindex 1981: index to selected literature on economic and social development/ Index d'ouvrages sur le développement économique et social.**

*Published in November 1982, 186 pages, IDRC-203e,f.*

The seventh in the *Devindex* series, this volume contains entries from the Federal Republic of Germany, India, Morocco, the Netherlands, Bangladesh, the Soviet Union, Sri Lanka, and Canada. Topics include: prescriptions for decision-making; development action-operational experience; consequences and evaluations; and resources and tools for development. Annotations are in English and French.

**Educational networks in Latin America: their role in the production, diffusion, and use of educational knowledge, Ernesto Schiefelbein. Published in November 1982, 44 pages, IDRC-TS39e.**

The problem of linking research results and the process of policy formation in education has been related to the isolation of researchers. One approach to overcoming this barrier has been to create networks — chains of individuals and institutions that interact in a systematic way. This publication looks at major education research networks operating in Latin America, and identifies the overlappings and possible social forces that shaped their development. Also published in French (IDRC-TS39f) and Spanish (IDRC-TS39s).

**L'adieu au pilon : un nouveau système de mouture mécanique en Afrique, par Paul Eastman. Published in October 1981, 68 pages, IDRC-152f.**

A translation into French of IDRC-152e, *An end to pounding*, this publication describes a novel milling system for cereal grains and legumes common to the semi-arid tropics. Although not a comprehensive instruction manual, this book provides planning guides, sample forms, and charts useful to entrepreneurs and owners of small-scale industries, cereal technologists, and agricultural and industrial policymakers who may consider establishing a milling operation.

**Village handpump technology : research and evaluation, Don Sharp and Michael Graham, editors. IDRC-204e.**

The review of research results presented at a workshop held at the University of Malaya, Kuala Lumpur, Malaysia, 16-19 August 1982, this publication examines a simple, low-cost piston and foot valve assembly of plastic, which was developed as the basis of a manual shallow-well pump that could be fabricated in developing countries using local resources. A network of projects examining the cost of manufacture, reliability and durability, maintenance capacity at the village level, and technical performance is examined.

**SALUS: low-cost rural health and manpower training: an annotated bibliography with special emphasis on developing**

*countries, volume 9. Rosanna M. Bechtel, editor. Published in December 1982, 149 pages, IDRC-187e.*

This is the ninth volume of a series of bibliographies that compile and coordinates information, both published and unpublished, on nontraditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and use of health workers.

**Bivalve culture in Asia and the Pacific: proceedings of a workshop held in Singapore, 16-19 February 1982, F. Brian Davy and Michael Graham, editors. Published in December 1982, 91 pages, IDRC-200e.**

This working meeting reviewed culture practices, postharvest handling, the economics of mollusc management, and future research needs for raising bivalves — oysters, mussels, clams, cockles, and others — as a source of food and greater income for the coastal peoples of the region. A summary of the workshop, 12 country reports, a list of participants, and a bibliography are included in the publication.

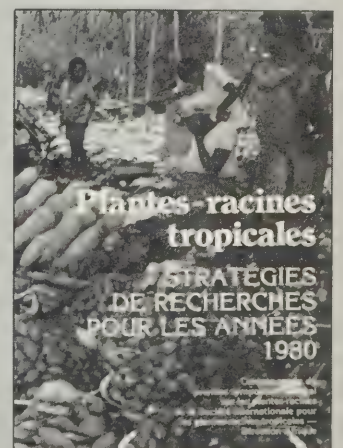
**Aquaculture economics research in Asia: proceedings of a workshop held in Singapore, 2-5 June 1981, cosponsored by IDRC and the International Center for Living Aquatic Resources Management (ICLARM). Published in December 1982, 128 pages, IDRC-193e.**

Fisheries biologists and

economists from nine South and Southeast Asian countries focused on microeconomic analyses of existing and experimental aquacultural production systems, and their role in social systems and resource allocation. This publication presents edited versions of the presented papers, includes a list of participants, bibliography, and conclusions and recommendations.

**Plantes-racines tropicales : compte rendu du Premier symposium triennal sur les plantes-racines de la Société internationale pour les plantes-racines tropicales, Direction Afrique. E.R. Terry, K.A. Oduro et F. Caveness, rédacteurs. Published in November 1982, 294 pages, IDRC-163f.**

French translation of IDRC-163e, *Tropical root crops: research strategies for the 1980s*, this publication gathers papers presented during a symposium on the four major root crops of the humid tropics — cassava, yam, sweet potato, and cocoyam. A discussion summary of the proposed strategies, a list of participants, and a bibliography are included.







In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

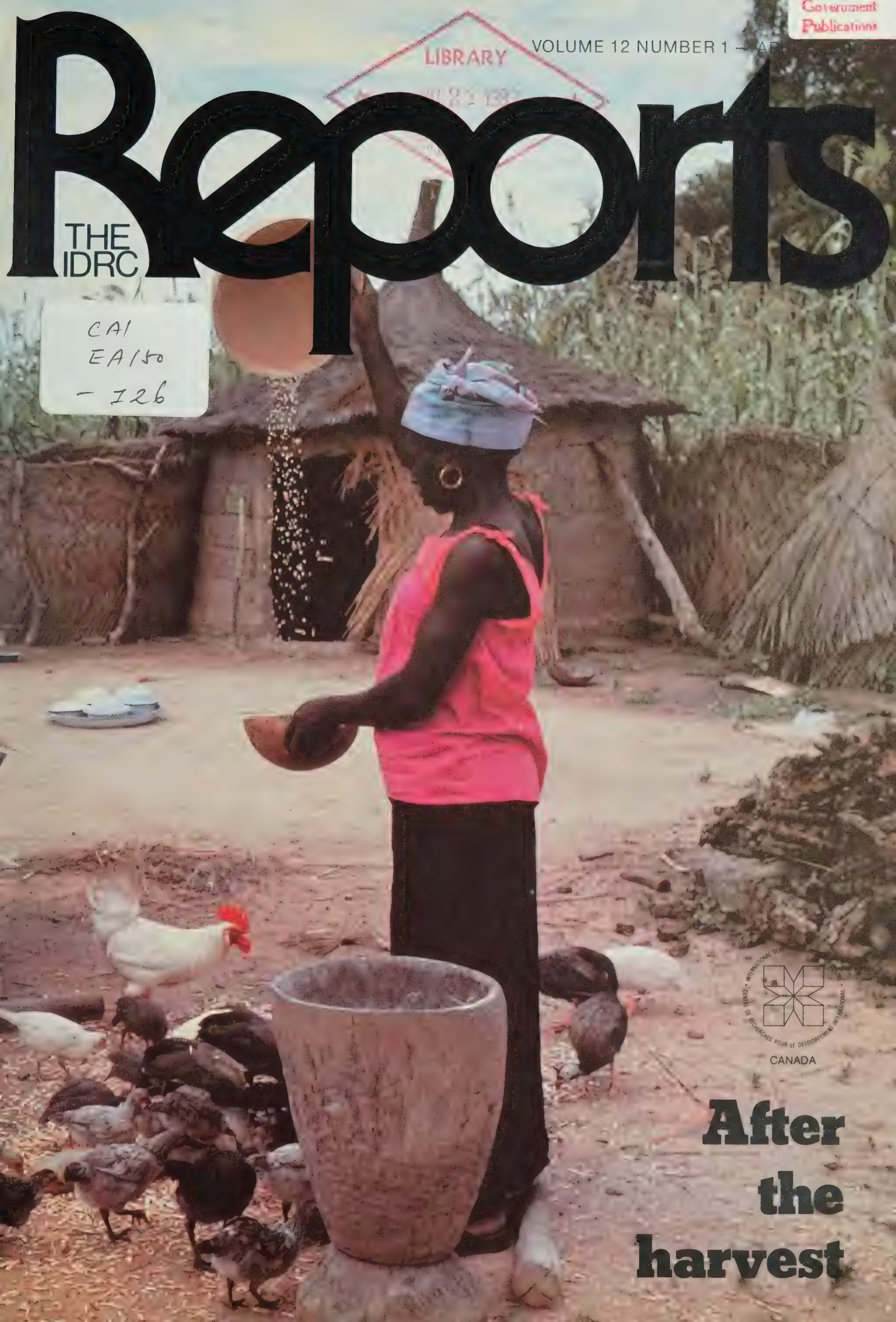
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# Reports

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**After  
the  
harvest**



# LETTERS

## Tuberculosis comment

I was interested in your article on tuberculosis in the October 1982 issue of *Reports* but would like to comment on some aspects.

First, the prime drugs for the treatment of tuberculosis at present are rifampin and isoniazid. Pyrazinamide is an extremely important drug as it does play a big part in preventing the development of resistance by the tubercle bacilli to each of the drugs. PAS is now no longer a drug of choice.

The problem with rifampin in programs in Third World countries is its very high cost; however, with short-term regimens of six to eight months, fully supervised on a bi-weekly basis, treatment in countries with more than minimal health budgets is now a real possibility, with the tremendous benefit of 100 percent sputum conversion.

I have considerable doubts about the BACTEC 460 machine with its radioactive media costs of \$2 per time, particularly when one is considering mass tuberculosis programs in Third World countries.

C.W.L. Jeanes,  
Chief,  
Health and Population  
Section,  
Canadian International  
Development Agency,  
Ottawa, Canada

## Precise drugs

"On the disease warpath" by Michelle Hibler (*Reports* 11(3), October 1982) states that "of the many drugs available for TB treatment, a combination of three is normally used — streptomycin, isoniazid and PAS or thiacetazone."

In fact, this is but one of the many primary drug regimens that are available to a tuberculosis control program. The particular interest in the above-mentioned drug combination relies on the fact that it is one of the most cost-effective available to developing countries, but it is not necessarily the one in most general use as the article seems to imply. I am also quoted in the article as implying that such primary drug regimens provide a success rate of cure of 99 percent, whereas 95 percent would be a more realistic figure. Other antituberculous drug regimens can be more effective, i.e., up to 99 percent cure rate, but would include expensive drugs such as rifampin, making them less cost-effective.

While precise details such as these may be of no real import to nonprofessional readers, they are needed to avoid serious misconceptions on TB treatment strategies in developing nations.

A. Laszlo,  
Principal Scientist,  
National Reference Centre  
for Tuberculosis,  
Bureau of Microbiology,  
Health and Welfare  
Canada,  
Ottawa, Canada

## Leprosy comment

I have read John Blair's article on leprosy (*Reports* 11(3), October 1982) with interest and submit the following comments.

To say that people do not seek treatment "until long after they have reached the infectious stage" is a misleading statement. The infectious stage is frequently present in very early lepromatous leprosy, even before there

are any lesions in the skin, and years before evidence of peripheral neuropathy appears.

Mr Blair says that the leprosy bacterium was "the first such organism ever to be identified as a cause of human disease." Has he forgotten the anthrax bacillus, or streptococci on heart valves?

Although some experts may have in the past speculated that tuberculosis helped stop leprosy in Europe by killing susceptible people, not many do now.

The article states that "at least 90 percent of the population is apparently immune." There are some areas in the world (e.g., West Bengal, Tamil Nadu, Zaire) where over 150 per 1000 (or 15 percent) of the population is affected by leprosy.

S.G. Browne,  
Secretary,  
The International Leprosy  
Association,  
Sutton, U.K.

## Pests and plants

The fifth point mentioned under "Panning pesticides" (Briefs, *Reports* 11(3), October 1982) reflects the kind of misinformation which you, yourself, have helped to combat in the same issue in your article on the CGIAR.

The suggestion that nine agricultural research centres follow a "practice of developing and distributing seed varieties that are heavily dependent on expensive and hazardous chemical pesticides and fertilizers" is false, at least as far as the International Rice Research Institute (IRRI) is concerned. For the past 10 years, IRRI has been involved in developing rice varieties that have built-in resistance to important insect pests, thereby enabling farmers to grow them under conditions conducive to producing high yields with a minimum of pesticides.

The plant nutrients needed for high yields are, of course, greater than the requirements for low yields, but those nutrients can come from any source — chemical or biofertilizer. With low

levels of nutrients, the yields of the new varieties will be no higher than yields of traditional rice and hence would contribute nothing extra to relieving world hunger. We believe adequate plant nutrients are an inescapable cost of adequate human nutrients.

Robert W. Herdt,  
Department of Agricultural  
Economics,  
IRRI,  
Manila, Philippines

## Kiting an idea

Thanks for another outstanding issue of *Reports*; it is a most worthwhile publication.

In the article "Pests of a feather" (*Reports* 11(3), October 1982), the author fails to mention a revolutionary method of bird control that requires no toxic chemicals, slaughtering, or other environmental or ecologically destructive inputs.

This is the "hawk kite" method where a kite with the general appearance of an avian predator is tethered in the air space above crops suffering bird damage. The simple technology has proved highly successful with commercial growers in the U.S.A. The kites are plastic, and the cost of protecting crops with this method is extremely low. These are large kites with a wingspan of 1.3 metres and are either suspended from balloons or tethered to 7-metre-tall poles.

L.A. Schaller,  
Director — Research,  
The Kusa Research  
Foundation,  
Ojai, California, U.S.A.

## Correction

An error in the article on tarwi ("High-living bean," *Reports* 11(3), October 1982) confused the upper and lower ranges of the plant's habitat. Tarwi is found at altitudes from about 1800 up to 4000 metres, mainly in cool valleys and basins at high altitudes in the Andes region of South America, and not "at altitudes of up to 1250 metres" as published.



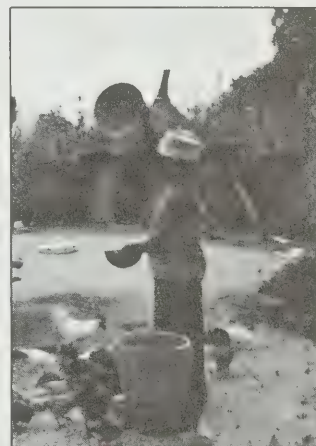
# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition Jacques Dupont; Spanish edition: Stella de Felerbaum. *Staff photographer*: Neill McKee.

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**Cover:** In Upper Volta, a woman winnows cowpeas after having pounded them to remove the seed coats. She has lost some of her food in this traditional processing — spilled, broken, or spoiled. Between harvesting and eating, as much as 30 percent of the food in developing countries is lost to inadequate handling and storage. Articles beginning on page 4 describe problems of the postharvest food system, and some steps being taken to solve them.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogotá D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 El Messaha St., Dokki-Giza, Cairo, Egypt).

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# AFTER THE HARVEST

EDWARD J. WEBER

## *Making the transition from field to table more certain*

Only a small proportion of food is consumed in its unprocessed state. Food is processed to satisfy needs and preferences for specific tastes, to improve food quality, to extract edible components, to preserve perishables for wider and more convenient consumption, to remove undesirable substances, or simply to make the commodity tastier and easier to eat and digest. The appropriateness and efficiency of these food transformation processes have been major concerns of IDRC's agriculture, food and nutrition sciences program.

Postproduction systems include all the activities to which food is subjected in sequence from harvesting until the end product is consumed. Research on postproduction, or postharvest, problems therefore embraces a wide range of technical experience. Technologies must be developed where they are to be applied, and designed in close cooperation with the people who will use them.

It has been estimated that the waste of food and food commodities runs as high as 30 percent in some countries, due to inadequate storage, handling and transport facilities and procedures, as well as through inefficient processing. This is the case particularly for cereals and grain legumes.

Other food commodities such as fish, meat, and vegetables are harvested and sold in a fresh state. Unless they are consumed or quickly processed into more stable forms, they are lost to the food system. Stabilizing these raw materials and/or converting them into more marketable forms with longer shelf life can reduce losses, thus increasing the availability of food. In addition, better processing procedures and products can often reduce human drudgery, improve the convenience and quality of a product, and increase its value to the producer.

On-farm postproduction activities have a great deal to do with postharvest losses. Timely harvesting, threshing, transport, drying, and storage are crucial for avoiding decay, mold, insect infestation, rodent damage, and general quality deterioration.

The new short-season, high-yielding crop varieties have brought new postharvest problems. In the case of rice, farmers are now able to grow two, and sometimes even three, crops where only one crop was grown before. The result is that a much larger quantity of rice must be handled, dried, stored, and processed. But the traditional sun drying is often made more difficult or impossible because harvest times can now occur during rainy periods (see article page 9).

IDRC has actively supported research on on-farm and farmer cooperative drying facilities that are simple, locally manufactured from readily available materials, easy to maintain, and which use local cheap fuels, and are capable of drying other commodities such as vegetables, fruits, legumes, and fish. A number of technical designs have been produced and tested in Asia, Africa, and Latin America. The economics, scale of application, and the management systems in which this equipment will prove functional and efficient are still under study. This is a multidisciplinary problem that cannot be solved by engineers alone. Government pricing policies for locally produced grain that do not provide a

premium for better quality products, and thereby incentives for investment in drying equipment, are another dimension of postproduction problems.

Most food commodities are harvested at a particular time. Consumption takes place continuously, however. Storage is therefore required to maintain a constant supply throughout the year. Storage can be on-farm for subsistence consumption, in large-scale central depots, or at various stages along the way in merchants' and processors' warehouses. IDRC project support has emphasized small-scale storage at the farm and cooperative level, and focused on traditional storage structures.

Both primary and secondary food commodity processing are important aspects of the postproduction system. Primary processing normally renders a raw commodity stable for storage and distribution or changes its form into one suitable for use by either the consumer or food processor — examples are the icing or salting of fish, and the dehulling and milling of grain. A substantial amount of IDRC resources has gone into small-scale mechanization of the dehulling and milling process for grains such as sorghum, millet, and cowpeas in semi-arid areas of Africa and Asia (see article page 5).

Developing countries often lack convenient processed forms of traditional foods. IDRC supports research on their development, but the local testing of these products, and putting in place the promotional and educational programs necessary to ensure their use, requires more research. An important aspect of this problem is the home preparation of nutritious food from local products for children two to five years of age, the group most vulnerable to malnutrition.

Small village-based food processing industries using locally important food commodities are an important link in the food chain. Improvements brought to their management and processing technology would allow for expansion of production, increase markets for farm or fishery products, and provide greater amounts of stable food products. Increased income and employment can also result. Process improvement research of this type forms an important aspect of IDRC's postproduction program. Marketing of products and services is also an integral part of the program's approach.

In future, implementation of research results and the application of existing technologies will be given emphasis in the program. The task is to understand and then serve the interests of potential customers, rather than attempt to make the customer accept what the researcher wants to research or the processor produce. This emphasis on delivery systems for improved technologies ensures that IDRC investment results in direct benefits to underprivileged people.

The following articles examine a few postproduction problems and the research carried out to solve them. They are part of wider efforts under way both to prevent food losses and to make more of the right kind of food available to those who need it most. □

*Edward J. Weber is Associate Director, postproduction systems and agricultural economics, of IDRC's Agriculture, Food and Nutrition Sciences Division, Ottawa.*



# AN ACQUIRED TASTE

JEAN-MARC FLEURY

In Bambey, Senegal, the woman carrying two bags of millet flour newly purchased from the pilot flour mill, says "Neex na sakan na!" ... "This is good, we got our money's worth!"

In Kaduna, Nigeria, the manager of the state-owned National Grain Production Company, which markets flour produced from local maize, says "If we produced twice as much, we could probably begin to meet the demand."

And in Pitsane, Botswana, the new sorghum mill had no sooner started production than it was unable to keep up with demand.

Each of these mills sells flours made from cereals — millet, sorghum, and maize — grown locally in the countries where the mills are located. In each case the key to the mill's success was a simple, efficient dehuller developed by the Prairie Regional Laboratory (PRL) of the National Research Council of Canada with support from IDRC.

The PRL dehuller can remove the seed coats of tropical cereal grains (millet, sorghum, and maize) as well as tropical grain legumes (cowpeas, pigeon peas, and soybeans). Once dehulled, grain can be pounded in conventional hammer mills to produce the sort of local flours that are

rapidly winning over consumers. Thanks to this new mechanical milling system, present-day Africa is reacquiring a taste for its native cereals.

Ironically, the food grains that are easiest to grow in Africa are difficult to prepare for consumption. Using traditional processing methods, African women spend from two to five hours a day dehulling and grinding sorghum or millet grain by hand with a mortar and pestle. This is the picture of traditional Africa: women laboriously pounding grain. In some buildings, African architects actually still set aside special areas for this activity, but fewer and fewer women can find the time and energy to devote to pounding grain these days. Traditional cereals are losing ground to foods that require little or no preparation, such as rice and bread.

Vendors of sorghum or millet flour processed the traditional way are easy enough to find in any marketplace. But these flours deteriorate quickly, explains Hyacinthe Mbengue, manager of the pilot dehulling/milling unit in Bambey, Senegal. "In the traditional process, we add about 600 grams of water for every kilogram of millet to be dehulled — the seed coat of the grain is easier to remove when it is wet.

*An experimental dehulling unit in Nigeria: local grains require local processing.*





The grain is then left to dry in the wetting gourd, but the resulting flour still contains 30 percent water." Flour prepared the traditional way starts turning rancid the moment it is dehulled. It must be used within two days of purchase. Generally speaking, local cereals are not available in a form that allows consumers to store them at home in a convenient ready-to-use form.

The mechanization of the milling process, during which the dehulled grains are ground into flour, has come a long way. Throughout Africa, home-makers can take their cereals — after they are dehulled — to small neighbourhood mills and have them processed to order. Until recently, however, there was no appropriate device for mechanically dehulling the grains, and this created a serious bottleneck in the marketing of local cereals and legumes.

One can, of course, always hire a "dehuller". In Senegal, there are people who charge 15 Fr CFA (just over 5 cents Canadian) per kilogram "with the bran thrown in" to process grain the traditional way. In Bambey, the inmates of the local prison provide this service. But not every town or village in Africa has a convenient prison!

Sturdy and simple, the PRL dehuller offers many advantages. Basically, the machine consists of a metal housing containing a series of rotating Carborundum stones similar to those used to sharpen cutting tools. The seed coat of the grain is worn off as it rubs against the stones, the rough panels of the dehulling chamber, and the other grains. No water is used. Grains of various sizes can be processed without complicated adjustments, and it is also very easy to adapt to different types of grain by regulating the input and output rates (see box).

Since the prototype was manufactured in 1973, several versions of the PRL mill have been tested in a dozen countries. In trials matched against all other devices on the market in Ethiopia, Mali, Senegal, and the Sudan, the machine proved to be the best suited to processing tropical cereals and grain legumes.

In Bambey, a small city of some 10 000 inhabitants not far from the National Centre for Agronomic Research, the pilot dehulling/milling unit began selling its flour products last October. The unit's inauguration coincided with the arrival on the market of the new harvest, a time of year when millet is widely available and at its lowest price. The milling unit was thus "competing" with traditional products at a time when prices were at an unrealistic low. However, word got around about the mill's good prices and satisfied customers are coming back. All those surveyed considered that, at 135 Fr CFA (\$0.49 CAD) per kilogram, the flour from the mill was cheaper than that sold by the market vendors.

Another of the reasons why consumers said they preferred PRL flour is that the new flour "rises." In the tradi-

tional wet-milling process, the flour is saturated with water, "whereas our flour is only 10 percent water. So our customer gets 900 grams of dry matter instead of 700 grams — a gain of 200 grams. You get more flour, that's why our product "rises" when you add water," Hyacinthe Mbengue proudly explains.

Flour produced by the dry method will also keep for weeks in its plastic wrapping. Customers of the mill can choose between millet and maize flour; semolina from the same two cereals; *saxal* (broken millet, and the most popular product after millet flour); and "maize rice", maize grits that can be prepared like rice. Some customers purchase 20 kilos at a time in order to stock up for family gatherings, and residents of Dakar, the Senegalese capital, reserve batches of 30 kilos when they pass through Bambey. "During our first month, we made 120 000 francs (about \$436 CAD)" says Mr Mbengue. "If we can sell between one and one-and-a-half tonnes a month, then this will be a highly profitable operation."

That may seem optimistic, but if earlier experiences in Nigeria and Botswana are any indication, Mr Mbengue may be right.

In Nigeria, the most populous nation in Africa, the prospects raised by the new milling system are as vast as the country itself. The influx of petrodollars has catapulted 90 million Nigerians into the twentieth century and agriculture, once flourishing, is reeling under the impact of imported commodities, including rice and wheat. Young people are leaving the land, and many fear the country has become dangerously dependent on imported food. "Our imported food bill has reached such proportions that we're in danger of

becoming a nation of starving people," says B.F. Iyiola, head of warehouse operations at the National Grains Production Company (NGPC) head office in Kaduna.

A public corporation, the NGPC's mandate is to encourage the production and consumption of local cereals. Eventually, the company will manage a vast network of mills supplying products made from the millet, sorghum, maize, and cowpeas that Nigeria can grow in large quantities, as the lush countryside around Kaduna testifies.

The IDRC has supported NGPC since 1972 to develop an up-to-date technology for processing Nigerian cereals and food legumes. The first model of the PRL dehuller was, in fact, designed for Nigeria. From 1973 to 1978, the first pilot flour mill in Maiduguri, in the north, produced flour from sorghum and maize. At the same time that it was forced to close its doors because of management difficulties, another pilot mill — this one equipped with two PRL dehullers — was opening in Kaduna.

Explains Mr Iyiola: "This new system enabled us, for the first time, to produce mechanically a maize flour acceptable to consumers. We are making this flour more widely available and the proportion of people who are using it is increasing." Sold at 0.95 *naira* (\$1.90 CAD) per two-kilo bag, the NGPC flour is forcing a very popular imported wheat semolina off the market.

Alongside the pilot mill, which has an effective capacity of 250 kg/hr, there now stands a large modern flour mill that turns out 1.5 tonnes/hr and operates with two shifts. "We are now supplying 20 tonnes a day," says Mr Iyiola, "but we could easily sell 40 without any advertising."

The large flour mill was built by a German firm. But it was the successful production of an acceptable "mechanical" flour at the pilot mill that enabled the NGPC to draw up the specifications for the larger operation, unique in the country.

As each new technique is mastered, the NGPC plans to market other products, including a finer maize flour that can be used to make bread. Bread-making methods involving "composite flours" (flours in which 5 to 30 percent of the wheat has been replaced by millet, sorghum, maize, soy or other flours) were developed as a result of an extensive research program begun in 1964 by the United Nations' Food and Agriculture Organization (FAO). Marketed bread made from composite flours would help reduce Africa's costly imports of wheat, estimated at about \$3.6 billion CAD in 1980 by Mr B.M. Vlavonou, an agro-industrial economist with the FAO, at a workshop on composite flours held last December in Dakar (see box).

Until now, apart from the consumers' initial mistrust of any new product, the main stumbling block to marketing composite flour products has been the problem of inadequate supplies of local cereals. In Upper Volta in 1974,

## A GROWING DEPENDENCE

African imports of wheat are increasing annually at the rate of 25 percent in value and 12 percent in volume. At that pace, they will reach \$24 billion CAD annually by the year 2000, says the FAO. Nigeria, for example, imported 1.8 million tonnes of wheat annually at the end of the 1970s, nine times as much as it imported at the end of the 1960s. These imports of a foodstuff that is a staple for less than one-third of the population of Africa contributes enormously to trade imbalances.

During the workshop on composite flours held in Dakar last December, FAO agro-industrial economist B.M. Vlavonou indicated that countries such as Angola, Ivory Coast, and Zaire could save more than \$12 million CAD a year by substituting 30 percent of wheat flour with local flours in bread.



and in Senegal in 1980, the sale of bread incorporating, respectively, 30 percent sorghum and 30 percent millet had to be suspended for want of sorghum and millet.

In Kaduna, Nigeria, the main difficulty facing the NGPC is the supply of maize. "At 300 *naira* (\$600 CAD) a tonne, Nigerian maize is much too expensive," Mr Iyiola points out. The pilot mill at Pitsane, Botswana, is the only one that has not faced this problem, and with good reason. Pitsane is located on the railway line linking an important cereal-growing region with Botswana's capital, Gaborone. But there again, demand for the sorghum flour has surpassed the mill's production capacity.

However paradoxical it may appear now that the processing technology is perfected, inadequate supplies of local cereals may become the main obstacle in Africa to the spread of mills such as those found in Bambey, Kaduna, and Pitsane. Millers are experiencing enormous difficulties in buying enough grain of good quality to keep their mills in constant operation.

Local cereals, in fact, have not found their way into the modern commercial channels. Most of the millet, sorghum, and maize is consumed by the farmers themselves who, from generation to generation, have been growing their "own" varieties. City-dwellers must thus turn to imported cereals. The commercial channels may bustle with the movement of cash crops such as peanuts, cotton, cocoa or coffee, but no comparable market structures have been established for local food crops. The new millet, sorghum, and maize mills should contribute to the formation of modern marketing networks. But it will take time.

One strategy to speed the process is to move the mills closer to the producers. This was done in Kanye, a small town in Botswana where the PRL dehuller was modified to process small batches of grain. Thus, each family can have its own grain ground into flour, ensuring that it eats the kind to which it is accustomed. The dehuller can process as little as 10 kg at a time, the average quantity found in the bags used in the surrounding countryside. The "public" flour mill in Kanye, as opposed to the other "continuous-flow" mills, eliminates the supply problem because the customers supply the raw material. The success of this approach also proves that the technique is cost-effective on a small scale.

But perhaps even better is the "mini" version of the PRL dehuller that can mill as little as two to five kg of grain at a time. This is roughly the same amount that thousands of village women throughout Africa manually pound each day. In Mali, technicians from the FAO and the Mali office of research on food crops and oilseeds proved that the "mini-PRL" outperformed all other existing devices in terms of energy consumption, time, and quality of dehulling.

In the mini-mill, the relatively heavy Carborundum stones used in the first

models have been replaced by resinoid disks, made by incorporating an aluminum oxide abrasive into a plastic matrix. Because these disks are much lighter, the power requirements of the "mini" are less than half those of the other machines. The Malian researchers are convinced that the PRL mini-dehuller is ideally suited to neighbourhood use.

Whether it be at the industrial level

as in Pitsane and Kaduna, at the semi-industrial level as in Bambey and Kanye, or at the neighbourhood or village level as in Mali, there now exists a mechanical milling system capable of processing Africa's own grains. In Mali, for example, *fonio* (*Digitaria exilis*), classified as a minor cereal, is grown over a very wide area. It makes an essential contribution during periods when other commodities are in short

## RUBBED THE RIGHT WAY

The PRL dehuller works by abrasion. This technique is gaining wider acceptance for processing tropical grains, as roller mills continue to predominate in wheat processing.

In the case of wheat, dehulling and milling are done simultaneously. The grains are crushed as they pass through a series of rollers placed closer and closer together. The separation of the seed coat (chaff and pericarp) from the flours (albumen or middle part of the grain) is achieved by screening and sifting. This is possible because the seed coat particles are larger than the fine flour particles. This "reduction milling" does not work with tropical cereal grains and legumes, however, because of their easily pulverized seed coats. The seed coats

of these grains break up into particles that are the same size as the albumen particles, making it impossible to separate the bran from the flour through simple screening.

Reduction milling also requires that the gap between the rollers be varied according to the size of the grains. The size of millet and sorghum grains, however, varies depending on what variety each farmer grows.

Using abrasion mills eliminates the need for making continuous adjustments between working surfaces. For grains of different sizes or thickness of seed coat, it is only the length of time required to grind off the hull that needs to be adjusted. The harder the hull, the longer the time inside the dehuller.



Locally manufactured, easy to operate and maintain, the dehuller is well adapted to Africa. (Above) A technician fits the final piece to a version developed in Botswana.



## TRITICALE TAKES ITS PLACE

In November, 1982, Kenya's Minister of Agriculture, Dr Munyua Waiyaki, declared triticale to be a scheduled crop. Since then, farmers have been waiting anxiously for the gazetting of prices for different grades of the grain. The publishing of the prices in the government's journal will ensure that triticale farmers qualify for the same type of financial assistance that wheat growers enjoy. Up to now, triticale farmers have had to rely entirely on their own resources, so there has been little incentive to increase production.

As in many developing countries, the demand for cereals in Kenya has rapidly outstripped supply. Wheat consumption is now estimated at 275 000 tonnes a year, an increase of more than 41 percent during the past eight years.

According to reports, it is unlikely that production of wheat will increase as long as current domestic prices hold. Yet it is inadvisable to raise the producer price of wheat since it is already well above world prices. To reduce Kenya's wheat imports, the production of alternative food cereals has become a priority, and triticale has been identified as a suitable supplement to wheat.

Studies on the adaptability of triticale in Kenya started as long ago as 1967. The satisfactory performance of the cereal, especially during the dry season and on dryland sites, encouraged further investigation at Njoro National Plant Breeding Station. With IDRC assistance, the station became part of an international network of triticale research in 1974.

Triticale thrives in acidic tropical soils, in dry zones, and at altitudes considered too high for wheat — precisely the conditions in which millions of farmers struggle in many tropical regions. Experiments show, too, that triticale can out-yield wheat by as much as 60 percent in acidic soils. And, because of its high lysine content, it is more nutritious than either of its parents (durum wheat and rye).

Triticale has also shown itself to be more disease-resistant than wheat. For example, where stem and stripe rusts continue to reduce yields of wheat, triticale is not affected. Researchers at Njoro say that the rapid rise in food demand

"is pushing triticale out of experimental plots and into the farmers' fields."

Even when triticale was quite new to Kenya, some farmers found it suitable for feeding poultry and livestock. But it was realized that if triticale became identified as animal food its acceptance as a human food crop could be hindered.

To help solve this problem, IDRC supported a modest project at the Home Economics Department of Egerton College in Njoro to develop recipes using triticale and to test consumer acceptance for triticale products. Pure triticale flour was used to make *chapatis* (flat bread), *maandazi* (deep-fried dough), and other products that are usually prepared from wheat in the home. Tested by villagers around Egerton College, the triticale products were found to be fully acceptable in taste and appearance.

A blend of maize meal and triticale flour was also used to produce the staple Kenyan dish known as *ugali* (stiff porridge). During a maize shortage in 1968, wheat flour had been used to enrich and supplement maize meal. This product was unacceptable to the consumers, however, since wheat's "elastic" gluten made it difficult to cook the porridge.

Experiments also showed that by mixing whole triticale grains with beans, peas, and other pulses, a meal similar to a popular dish called *githeri* or *nyoyo* was obtained. The dish is usually made with maize and beans.

The results of this project, presented during a workshop in August 1981, showed that triticale could fit directly into the diet of the majority of Kenyans more easily than wheat. A committee made up of workshop participants was formed to advise the Ministry of Agriculture on ways of promoting triticale as human food.

The biggest obstacle now remaining to increasing triticale production is that farmers do not know what profits they will reap from their crop. As a food crops officer in the Ministry of Agriculture said, "A producer price must be negotiated so that farmers are encouraged to plant more hectares to triticale."

Fibi Munene

supply. *Fonio* seeds are very small, making the thankless task of dehulling them even more tiring. But here again, the PRL mini-dehuller performs flawlessly and at an acceptable cost.

The design and operation of these novel milling systems are being tested in Tanzania, Ethiopia, and Kenya with IDRC support. Because only a few prototypes have been built, it is not yet possible to put a price on the mini-PRL. The parts, however, cost about \$400 CAD. And since Carborundum stones and even resinoid disks are sold in Third World countries, there is nothing to prevent local artisans from building the dehullers themselves. The machine in Kanye was locally built. Furthermore, IDRC provides detailed plans of the mini-dehuller to interested persons through its postproduction program (IDRC/PPS, 10454 Whyte Avenue, Suite 304, Edmonton, Alberta, Canada T6E 4Z7).

To give an approximate idea of the costs involved, the 10- and 20-kg capacity dehullers manufactured in Canada are valued at between \$5000 and \$8000 CAD. The IDRC is discussing the feasibility of mass producing the dehullers locally with African manufacturers.

Still on the subject of costs, a continuous-flow mill involving a PRL dehuller, a flour mill, a diesel engine and related installations, excluding buildings and land, would require an outlay of \$20 000 to \$25 000 CAD. Such a mill can process up to three tonnes of grain daily. Before making such an investment in a mill, a cost-benefit study is essential. An IDRC-published booklet, entitled *An end to pounding*, provides a clear explanation of how to proceed. The fact remains, that the effectiveness of such facilities has already been proven in parts of Africa.

The dehuller had been designed to process grain legumes such as cowpeas, pigeon peas, and soybeans. Until now, however, the new mills have been applied successfully only in processing cereals. A balanced diet requires that the cereal intake be supplemented by animal protein or, failing that, vegetable protein. The consumption of legumes is currently declining in Africa, a trend that carries with it the risk of dietary imbalance. Thus, in Bambey, there are plans to begin quickly to produce flour from soybeans, which have recently been introduced as a crop in Senegal. Customers will then be able to mix cereal and legume flours, something that occurred spontaneously in other soybean-growing regions.

Providing a balanced diet for the people of an entire continent is a lot to expect of the PRL dehuller. A great deal remains to be done. And yet this simple, small machine — like so many ingenious inventions — has the incalculable advantage of being readily adapted and used throughout Africa. It can be a strong link in the chain of solutions that must be forged if people are to be fed adequately in the future. □



*A cooperative program  
cuts rice losses in Southeast Asia*

# MAKE EACH GRAIN COUNT

MICHELLE HIBLER

**I**n the early 1960s, the Philippines was a net importer of rice. Then came the revolutionary new high-yielding varieties and the vigorous implementation of a "Rice and Corn Self-Sufficient" program, a goal that was reached in 1976 for rice. A year later, the Philippines exported some 300 000 tonnes of rice.

The increase in the Philippine's rice production — from 4.1 million tonnes in 1965 to 6.5 million in 1977 — is impressive. Equally impressive, however, is the fact that from 650 000 to 1.95 million tonnes of that rice — 10 to 30 percent — were lost between the fields and the consumers. At average export prices of US\$200 a tonne, the loss cost the Philippines from US\$130 million to \$390 million.

According to the United Nations' Food and Agriculture Organization (FAO), postharvest losses of rice are among the highest of the major crops grown in developing countries. In 1977, Indonesia, Malaysia, Thailand, and the Philippines lost 3.4 to 8.6 million tonnes of rice valued at US\$822-2081 million.

Dramatic though these figures may be, they do not tell the whole story. As Datuk Arshad Ayub, Secretary General of Malaysia's Ministry of Agriculture, told participants at a 1980 meeting on grains postharvest technology: "The rice

industry is made up mainly of people who have been identified to exist below the poverty line." It is those millions of small farmers, for whom the rice crop is a major source of food and income, who bear the brunt of the problem.

Somewhat ironically, the technological breakthroughs that made possible the dramatic increases in production are also partly to blame for the losses. The short-season, high-yielding rice varieties developed in the 1960s made possible two crops a year. Some of the new varieties shatter more easily than the traditional ones, however, requiring prompt harvesting, and they germinate quickly when drying is delayed. Under double cropping, the harvesting, threshing, and drying needs of one crop come at the same time as land preparation needs for the next, placing a heavy demand on scarce labour. Drying and storage facilities, already strained to capacity, could not cope with the larger harvest, particularly the rainy season crop that could not be sundried.

In the rush to increase production, planners had apparently neglected to ask two basic questions: "What happens to the crop?" and "Who does what to the crop?"

According to Dante de Padua, IDRC postproduction adviser based in the Philippines: "It was felt by many

*Weighing rice: poor threshing and drying may cheat them of good measure.*





planners and policymakers — and their subsequent actions supported their thinking — that development of the processing sector was a simple matter of transplanting a highly developed Western technology." Accordingly, mechanical harvesters, dryers, and storage silos designed for cereals other than rice and for use in different social, technical, and climatic conditions, were imported or manufactured locally.

The equipment was far too large for the farmers and villagers. In many cases, they did not have transportation — or even feeder roads — to get their harvest to the centralized facilities. The dryers produced thermal stresses in the fragile paddy (unmilled rice), resulting in fissured and broken grains and making milling all the more difficult. Nor could they cope with the many varieties and grades of paddy. Lack of technical know-how resulted in inefficient operation. Moreover, the new technology did not take into account the traditional role of people in harvesting and threshing, or the relationship between farmers, labourers, and small millers.

#### CUTTING LOSSES

The worldwide problem of postharvest losses led the UN General Assembly in 1975 to call for a 50 percent reduction in postharvest losses within 10 years. Attempts to reach that goal had begun earlier in Southeast Asia. In 1972, a cooperative program on postharvest rice technology had been initiated by a working group of Asian food scientists and technologists. This led in 1976 to the establishment of the Southeast Asia Cooperative Postharvest Research and Development Program. Jointly sponsored by IDRC, the United States Agency for International Development (AID), the Canadian International Development Agency (CIDA), the Australian Development Assistance Bureau, and the government of the Netherlands, the program seeks to develop postproduction capability in five countries: Indonesia, Malaysia, Singapore, Thailand, and the Philippines. The government of West Germany and the Swedish Agency for Research and Cooperation with Developing Countries also support various program activities.

The program's technical team, made up of experts from various disciplines and from the different agencies, have stressed a multidisciplinary, systems approach to rice postharvest research. This approach is essential because, as a 1980 report of a survey carried out by the U.S. Department of Agriculture on behalf of AID notes: "Rice is subjected to more handling and processing steps as it moves from the rice paddy or field to the consumer than other grain products in developing countries." And scientists agree that improvements to just one of the steps out of the context of the whole system are generally ineffective.

The first comprehensive study of

postharvest systems in Asia began in 1976 in the Philippines. Supported by IDRC, it brought together the Agricultural Engineering Department of the University of the Philippines at Los Banos (UPLB) and the Philippines National Grains Authority in developing, testing, and disseminating improved methods of handling and processing paddy. The National Grains Authority — now expanded and renamed the National Food Authority (NFA) — is responsible for all food industry development in the country.

According to Wenceslao Sison, leader of the NFA team, "The number one problem was to speed up threshing operations." A great deal of threshing is still done manually in the Philippines, and a shortage of farm labour means that the grain often waits too long in the field, exposed to rain, sun, and predators. The rainy season crop is particularly vulnerable and should be threshed, cleaned, and dried within 24 hours of harvest to avoid deterioration. The UPLB studies have also shown that delays in threshing reduce the amount of rice recovered during milling.

Of the many small threshers commercially available, eight were selected for testing. One in particular — the C.S. mini-AGAD — proved affordable and efficient, even for the wet season paddy that chokes most threshers. After modifications made it easy to dismantle so it could be carried through muddy fields, the improved thresher won a presidential award for innovation.

Unfortunately, finding an adequate dryer was not so simple. Two types were commercially available for farm and village use. The flatbed dryer, developed earlier by UPLB and the International Rice Research Institute (IRRI), was found to produce uneven drying, and consumed too much fuel in the process. A cylindrical dryer, called a Vagmacor, was more efficient, but was too expensive for small farmers.

One solution appeared to be the design of a farm-size dryer that could be used to predry the paddy. Normally, farmers transport their paddy to the mill for drying and milling, resulting in delays that cause serious deterioration of the wet-season crop. By reducing the moisture from 26-30 percent to 18 percent, the paddy would keep for a few weeks until final drying.

A vertical batch dryer was designed by the researchers for use on farms or in small mills. Because the bin can be divided into four compartments, four different farmers can dry their paddy simultaneously. Built of locally available materials, it can be fueled by gasoline, kerosine, or rice husks. Despite its estimated cost of US\$300-400, however, preliminary indications are that the dryers are still not within the means of individual farmers. Further research will look at drying through farmers' associations and at mills.

Unlike threshers and dryers, small mills are in widespread use. Most are

of the traditional, single-pass type — a steel roller Engleberg called a *kiskisan*. Although inexpensive and rugged, they "are very notorious for low recovery and poor quality," says Sison. The NFA had attempted to phase out the *kiskisan*, but this proved impossible. According to Sison, some 11 000 of them are in use in the country. "If we are going to change to imported mills," he says, "it will lead to spending a lot of foreign exchange we cannot afford."

The farmers who use the mill's by-products — crushed husks mixed with the bran and broken rice — to feed their animals, and the millers who receive the by-products as payment, were also reluctant to change to modern rubber roller mills that do not grind the husks.

Comparative tests of *kiskisan* mills showed that one, manufactured locally by Castillo and Sons, had the best recovery rate. The researchers concentrated on improving it further by replacing half the steel roller with cast stone. They also found that by mounting one *kiskisan* on another, a 68 percent recovery rate was possible. The first mill dehulls 90 percent of the paddy; the second completes the dehulling and whitens the rice.

#### PROJECT PAYBACKS

Among the most successful innovations of the project was the development of a quality tester. Previously the only testers available were imported at a cost of close to US\$2000. Buyers thus determined the quality of the rice, and the price paid, by a simple visual check. This led to disagreements with the farmers. The simple portable tester developed by NFA costs less than \$US135, according to Sison, and by mid-1982, 100 units had been manufactured and sold. The NFA estimates that it will ultimately need 4000 testers for its grain depots and buyers.

Studies are continuing on methods of stocking the paddy prior to milling and on improving storage facilities which, it is felt, could have a major impact in reducing pest and rodent infestation. Associated with this are studies of appropriate methods of fumigation. Improved commercial mills are also being tested.

The NFA, through the National Post Harvest Institute for Research and Extension, is demonstrating the new equipment to farmers' associations, cooperatives, agricultural colleges, extension workers, and similar people and organizations.

To promote cooperation and coordination of postharvest research in the region, the program's technical team is also communicating the results to researchers, by means of workshops, exchange programs, and publications.

If efforts succeed in reducing losses by half, many countries would no longer need to import rice. And as Datuk Arshad Ayub stresses: "Minimizing this loss would also imply success in trying to eradicate poverty among the paddy farmers." □





Willy Brandt (centre) at the Commission meeting hosted by IDRC president Ivan Head.

## COMMON CRISIS

GERRY TOOMEY

Three years ago the Independent Commission on International Development Issues, better known as the Brandt Commission, sounded an alarm heard around the world. "At the beginning of the 1980s," the Commission declared, "the world community faces much greater dangers than at any time since the Second World War. It is clear that the world economy is functioning so badly that it damages both the immediate and the longer-run interests of all nations."

The Commission is still at work trying to rouse the world and recently renewed its warning about the deteriorating global condition, this time focusing on the crisis of international finance.

The Commission's original report, *North-South: a program for survival*, warned that a major redesigning of the economic relationships between the developed and developing countries, among other changes, was needed to avert a "serious breakdown of the world economy in the decades of the eighties and nineties." Few of the Commission's recommendations were implemented, however, and the subsequent meeting of world leaders in Cancun, Mexico, while making people around the world more aware of the interdependency of the North and South, achieved few immediate, concrete results.

At its most recent meeting (in Ottawa, Canada, last December), the Commission again warned of the need for immediate action. As it had feared, the world economy is in a recession. World trade is flagging, factories in indus-

trialized countries are idle, unemployment has become a social as well as an economic crisis, and many developing countries cannot finance vital imports such as fuel, machinery, and food. To make matters worse, the natural tendency of countries is to contract: Production, employment, trade, aid, and credit are shrinking.

The Commission, composed of senior politicians, economists, and academics from some 20 countries and chaired by former West German Chancellor Willy Brandt, sees this contraction — more specifically, the problem of liquidity or access to money — as the most pressing global problem. It is a "crisis of confidence in international finance," says the Commission.

The liquidity problem, superimposed on the more serious structural weaknesses of the global economy and monetary system needs immediate attention, the Commission argues. Developing countries, with debts of US\$600 billion, are having trouble borrowing in private capital markets. Many are near bankruptcy. Bank lending slowed to a trickle in 1982, and international reserves are decreasing. This process is dangerous: "If each country retreats inwards through an impulse of self-preservation, we shall only worsen our collective and our individual conditions," says the Commission.

Because neither the governments of developed countries nor the international money market feel able to fill the financing gap, the Brandt Commission recommends, as part of an emergency

plan, that more funds be made available through multilateral lending agencies. It calls for the International Monetary Fund (IMF), for example, to increase substantially its Special Drawing Rights. These accounting units honoured by IMF members would be distributed to reflect the needs of developing countries, especially the poorest.

IMF quotas — that is, contributions from member countries — should also be doubled, the Commission argues. That would give the Fund an extra US\$32 billion over three years. But even this is "no great radical step forward," says Commission member and Secretary-General of the Commonwealth, Shridath Ramphal. "In fact, when the quotas were first established in 1965, they represented 12 percent of world trade. They have since gone down steadily. A doubling of quotas will only take them up to something like five percent of world trade, which is where they were 10 years ago. It is a modest step forward in many respects."

"It is the provision of financial flows to overcome the problems of liquidity that we hope will regenerate world trade," says Mr Ramphal. "With that process of regeneration, we hope the protectionist barriers — almost protectionist barricades — that are being erected will come tumbling down."

To complement liquidity increases from the World Bank and IMF, the Commission urges government creditors to forgive all debts of the least developed countries. "This would eliminate almost half of the total foreign debt owed by the low-income countries of Africa in 1981," the Commission notes.

The recommendations emanating from the Brandt Commission's four-day meeting in Ottawa touched only on the liquidity issue. These and other emergency proposals dealing with trade, food, and energy were subsequently published under the title *Common crisis*\*. Their aim is to avert "world economic collapse and the subsequent chaos and human suffering."

While Brandt and his Commission may sound like doomsday prophets, they are optimistic that their proposals could influence the outcome of the UNCTAD VI trade conference in Belgrade in June 1983 and the summit of non-aligned nations slated for March 1983 in New Delhi.

"There are people today who think we just can't do much about the world crisis," says Mr Brandt. "I have decided, for the years I have left in my life, not to accept this view, but wherever possible to counteract negative, destructive, and suicidal forces." □

\*Published in the U.K. by Pan Books, 18/21 Cavaye Pl., London, England SW10 9PG.



## Oldest cattle not extinct

The kouprey, the most primitive ancestor of living cattle and previously feared extinct, has emerged from the war-torn forests of Indochina apparently alive and well.

The sighting of five kouprey — an adult male, two females, and two calves — by a scientific search party near the Thailand-Cambodia border renews hope that these ancient wild oxen have survived the turmoil in the area that was their natural habitat.

The "wild cow of the bush" stands almost two metres tall, making it one of the largest wild oxen. Many prehistoric cave paintings and temple statues testify to the once-plentiful kouprey's usefulness to early people in the region.

Scientists would like to capture some of the rare animals and preserve the line. The kouprey could be an important genetic resource, providing hardiness, strength, or other desirable characteristics to improve modern livestock production in developing countries. (*NY Times*)

## Baby food action

The International Baby Food Action Network (IBFAN) has published an action guide for groups involved in implementing and monitoring the WHO/UNICEF international code of marketing for infant feeding products.

The code attempts to lay down a standard of conduct that would prevent inappropriate and aggressive marketing of breastmilk substitutes in developing countries.

Formed in 1979 in the wake of a WHO meeting on infant feeding, IBFAN is an

international network of citizens' groups that has carried out independent investigations of the marketing practices of multinational infant food industries. IBFAN notes the code is "a minimum requirement and only one of several important actions required in order to protect healthy practices in respect of infant and young child feeding."

The network feels that one of the actions required is to turn the code into national legislation in developing countries. They note that "most major sellers of infant formula admit that they will follow the code only if and when it is translated into national legislation."

The action pack is intended to provide background information, action plans, and resources that will assist groups in implementing the WHO/UNICEF code, and in monitoring industry marketing practices.

Available from IBFAN London, c/o 467 Caledonian Road, London N7 9BE, U.K.

## Co-ops questioned

Can co-ops continue to work well locally, while trying to operate effectively at a central or national level as well?

The government of Tanzania believes that local and regional cooperatives are important means of improving the well-being of its rural people as well as restoring national growth and productivity. It wishes to train people to establish and manage agricultural, industrial, housing, and credit co-ops.

But Tanzania also recognizes that there is a contradiction of principles

in this plan: Co-ops are co-ops because they are based on local participation and control, not managed by a central body or government.

Canadian co-ops are dealing with the same sort of problem, but from the other end. They grew from the local level, but gradually gave greater responsibilities to central organizations such as credit union centrals and federations. Now, they too face the question of how to combine local independence with coordinated action at other levels.

A study of cooperative management in Canada and Tanzania carried out at York University (Toronto), with IDRC funding, may provide some answers. A team of Canadian and Tanzanian researchers will study the strengths and weaknesses of the cooperative systems of the two countries, and see what strategies each uses to act effectively at the national or central level, while promoting genuine development and cooperation at the local level.

## Saving children

Four breakthroughs could soon be saving the lives of 20 000 children a day, says this year's "State of the World's Children" report from UNICEF, the United Nations Children's Fund.

The first is a simple solution of water, salts and sugar that can be given by mouth to children suffering from dehydration caused by diarrheal diseases. Previously, the only treatment had been expensive and sophisticated intravenous feeding. Five million children die each year because the treatment is not available.

A second advance is the development of a heat-tolerant measles vaccine. It will now be easier to extend immunization programs in

rural areas of developing countries with only simple refrigeration. Another five million children die every year from diseases preventable by immunization — about 1.5 million from measles.

The third change is the renewal of efforts to promote breast-feeding. Bottlefed babies are three to five times more likely to sicken and die than breastfed infants. Finally, the widespread use of simple child-growth charts, kept by mothers, has made malnutrition and undernutrition more visible for action.

The report says that by using these opportunities to their fullest, the world can "do so much for so many and for so little."

## Accepting TBAs

Traditional birth attendants (TBAs) were once the "poor relations" in the family of health workers. They are now gradually gaining approval from health authorities in developing countries, according to the results of a survey published by the World Health Organization (WHO).

It is not too soon.

Traditional birth attendants deliver anywhere from 60 to 80 percent of all babies in developing countries. They often provide maternal care before and after birth.

The WHO has been advocating the use of TBAs to help reduce maternal and child death rates: Each year, some 500 000 women die from the complications of childbirth, and over 10 million newborns never live to see a first birthday.

In 1972, a WHO survey of health administrations had revealed that TBAs were considered to be a replaceable, "unavoidable interim measure." Today, who reports that 56 of 64 countries surveyed consider TBAs irreplaceable in the decades ahead, and that while "expanding professional training,



countries are also expanding the training of traditional birth attendants."

The acceptance is reflected in the doubling of the number of countries formally recognizing the skills of TBAs through programs of licensing, certification, or registration. There are also twice as many training programs for TBAs as there were in 1972. (WHO *Chronicle* 36(3))

**Fishmarkets**

Although Chile is one of the world's top five fish-exporting nations, the hundreds of small coastal fishing villages or *caletas* that dot its coastline have netted few benefits.

Because they are so isolated, the *caletas* have no real market for the sardines, mackerel, or hake they catch. Fishing for themselves provides food, but no income to maintain boats and equipment or improve livelihoods in the poor communities.

With aid from IDRC, the Fishery Development Institute in Santiago will try to match the right product to the right market to help the *caletas*.

The demand could come from Chile's national school feeding program, and the supply could come from *caletas* equipped with the appropriate deboners, smokers, and dryers to produce suitable stable fish products.

The Institute will work with nutritionists and food technologists in the school program, as well as engineers and villagers, to develop a small-scale fish processing industry. Such research, if successful, will improve both the villagers' incomes and the children's nutrition.

**Re-inventing the wheel**

With an old tire, two wooden disks made from packing crates, a broomstick, and a short piece of metal pipe, technicians in Paraguay

have re-invented the wheel.

More exactly, by recycling old tires into new wheels for hand carts or wheelbarrows, and using only scavenged materials in the process, a team from the Institute of Basic Sciences of Paraguay's National University at Asunción have made life simpler for those who carry loads in developing countries.

The wheel requires no inner tube, because the pressure of two wooden disks on each side of the tire is sufficient to keep it from deforming. The assembly is able to support loads of up to 80 kg. The disks themselves are held together with four dowels cut from a broomstick. The wheel's axle is made of a short piece of water pipe, with bent nails serving as cotter pins to hold it in place.

Besides profiting from waste, the Paraguayans say the wheel is cheaper than one made of metal, and can better roll over obstacles and rough ground. (John Fitzpatrick, Univ. Nacional de Asunción, Instituto de Ciencias Básicas, Ciudad Universitaria-San Lorenzo, Casillo de Correo 1039, Asunción, Paraguay)

**Tropica-Canada**

A new newsletter, *Tropica-Canada*, aims to inform and involve the scientific community in Canada in international health concerns and research.

Published quarterly by the International Health Committee of the Canadian Society for Tropical Medicine and International Health, the newsletter's first issue promises to: present pertinent and stimulating information on international health; catalyze research activity in order to provide a better Canadian resource for solving international health problems; and provide a mechanism for

the exchange of ideas and to extend that communication to international organizations and other countries, particularly with reference to developing country health problems. (*Tropica-Canada*, c/o Canadian Public Health Association, Suite 210, 1335 Carling Avenue, Ottawa, Canada K1Z 8N8)

**Tourism monitored**

Concern over the effects of tourism in developing countries (see *Reports* 10(4), January 1982) continues to grow. With the opening of a new office in Thailand, an international church group has taken on the role of watchdog for the world's largest leisure industry.

The Ecumenical Coalition on Third World Tourism plans to set up an information and resource network to monitor, publicize, and try to reverse the damaging trends of tourism in developing countries. At the same time the Bangkok-based organization will promote alternative forms of tourism more sensitive to the needs of host nations.

Working through local groups, the Coalition aims to try to reduce the negative effects of tourism, and build on the positive. Among its concerns are organized sexual tourism based on the exploitation of poor women, the "poaching" of educated workers from lower-paying government jobs, and the shifting of resources from development programs to tourism.

(Ecumenical Coalition on Third World Tourism, P.O. Box 10-1014, Bangkok 10311, Thailand)

**New international communications award**

An international prize in communications has been established by the Canadian Commission for Unesco and Teleglobe Canada, the public corporation responsible

for Canada's international telecommunications services. Named the McLuhan Teleglobe Canada Award, after the Canadian communications philosopher, the late Marshall McLuhan, the \$50 000 CAD prize and medal will go to "individuals or groups of individuals who have contributed to a better understanding of the influence of communications media and technology in society."

Competition for the award, which will be offered every two years, is open to candidates of all nationalities.

Teleglobe Canada is funding the award, which will be administered by the Canadian Commission for Unesco. It will be presented for the first time toward the end of 1983, World Communications Year.

A jury of five independent Canadian specialists will choose the winner from a list of candidates put forward by a network of national commissions (or recognized organizations) of the 157 Unesco member states. The deadline for submission of nominees to the Canadian Commission is 31 July 1983.

Marshall McLuhan, who died in 1980, won world recognition as a scholar in communications. His analyses of the profound influence of the communications media in our electronic age placed him among the best thinkers of our time. His famous aphorisms, "the medium is the message" and "the global village," have become part of everyday thought and speech.

Submissions of nominees for the award should be sent to: The McLuhan Teleglobe Award, Canadian Commission for Unesco, 255 Albert St., P.O. Box 1047, Ottawa, Canada K1P 5V8.



“I have to get up at 4 o'clock every morning to get to work. Walking to the bus, transferring several times, and waiting for buses takes three hours in the morning and three hours at night. When I arrive home, I am tired. We never go into the city for a movie or football game — it's too far. My children's school is also far. Anyway, it's too small, so not many children can go.”

So says Manuel, a resident of Mexico City who is lucky enough to find occasional work in construction. While he knows that all the living conditions in his city are difficult, transportation problems are uppermost in his mind. His views are shared by development critics René Dumont and Marie-France Mottin, who paint a rather bleak picture of development in Latin America, calling it rather “misdevelopment.”<sup>1</sup> For example, at its present rate of growth of nearly one million per year, Mexico City will have a population of 35 million by the year 2000. Half the population, now about nine million people, live in shanty-town districts.

Since 1945, most countries of the Third World have experienced rapid urbanization. Many governments consider the most pressing development problems to be in the rural areas, where an overabundant labour force works mainly in

agriculture, a sector with low productivity. For them, urbanization has been equated to economic diversification, to an all-too-appealing modernization.

But the resulting improvisation in urban development planning has led to severe problems of congestion, not only in transportation but also in employment and housing. In Southeast Asia, for example, the industrial and urban infrastructures in 1960 were compared to those of Japan in 1920. Several authors described the development of cities in the region as “pseudo-urbanization,” noting that it is not much more than the transferring of rural ways of life to increasingly large and densely populated areas. Young, unemployed men form the bulk of the rapid rural-to-urban migration. When the *samlor*, a type of rickshaw popular as a low-cost mode of transport, was banned in Bangkok in 1960, half of the 11 000 drivers thrown out of work were peasants who had come to the city to earn something for their families who were still struggling in the villages.

#### PARA-TRANSIT

Thailand's *samlor* is only one of many artisanal modes of transport invented or adapted in Asia as a result of rapid urbanization (see *Reports* 8(3) September 1979). In a

study on urban tensions in Southeast Asia in the 1970s, A.A. Laquian, former Associate Director of the IDRC's Social Sciences Division, describes the phenomenal spread of these traditional means of transportation. In Jakarta, for instance, no fewer than 200 000 *becaks* (pedal-powered tricycles) provide jobs for 400 000 workers otherwise unable to enter the labour market because they lack seniority or skills. What modernization could justify the abolition of 400 000 jobs?

An IDRC-supported project, the results of which were recently published, provides a positive assessment of these means of transportation in five cities in Asia: the *becak* in Bandung and Yogyakarta, Indonesia; the *samlor* and *silor* in Chiang Mai, Thailand; the *jeepney* in Manila, Philippines; and the *dolmus* in Istanbul, Turkey<sup>2</sup>. All cities suffer from chronic traffic congestion problems. One of the issues that concerned the teams of researchers in the five cities examined was whether the low-cost transportation (LCT) aggravated the problems.

In comparing such different cities, with very different modes of transport, the researchers concluded that if the *samlors* and their ilk created some problems, they also

Low-cost transportation, like this *becak* (right) in Indonesia, or this *samlor* pedicab in Thailand (far right), give the urban poor who ride them access to jobs, health, education, and other social services at an affordable cost. And for the drivers, who may not have skills or training, low-cost transportation provides employment that might not be possible otherwise. The *dolmus* in Turkey (below, right) may add to traffic congestion, but it provides a cheap and flexible service to areas outside mass transit routes.



# MOVING THROUGH THE CITY

JACQUES DUPONT



solved many others. One of their most important contributions was in providing jobs for hundreds of thousands of migrants, who form a largely unskilled labour force — although, as noted by all the research teams, the profit made by the driver or the owner-operator is small.

Despite the vehicles' popularity, however, there seems to be little inclination on the part of authorities to recognize the value of the LCT — even in cities where drivers' or owners' associations exist to defend them. Municipal policies tend to keep this type of transportation marginal.

The studies described in the book provide timely data for civic authorities in the countries involved, and should help them take a more rational approach to public transportation. As more formal mass transit schemes are costly and lack flexibility, the LCT should be considered as an alternative that can be improved rather than as a nuisance to be eliminated.

Will the LCT become the scapegoat for governments wishing, belatedly, to rationalize a disorganized and too-rapid urban growth, rendered even more chaotic by the invasion of massive numbers of cars and trucks in streets better suited to *becaks* and *jeepneys*? If so, the future of Asia's

cities may well resemble René Dumont and Marie-France Mottin's Mexico City, where "Two million vehicles try to move in massive traffic jams, as the hundreds of thousands of privileged car drivers asphyxiate those who must walk or cram themselves in buses and who are condemned in perpetuity to the smoke of exhausts and factories."

<sup>1</sup>René Dumont et Marie-France Mottin, *Le mal-développement en Amérique latine*, éditions du Seuil, Paris, 1980, 281 pages.

<sup>2</sup>Low-cost transport in Asia: a comparative report on five cities, *IDRC-183e*, 1982, 77 pages.

*In Manila, as elsewhere in Asia, the "modernization" of urban transportation is perceived in terms of rapid rail service or expressways. Such systems, if they exclude low-cost modes of transport like the jeepney and its competitor (below) from the streets, may create many other problems in solving some. Low-cost transport may be more appropriate, both economically and socially, to a developing country. Researchers suggest that such modes be considered an alternative that can be improved, rather than a nuisance to be eliminated. (Below, at right) The human dimension of transportation: a festival day in the Philippines.*

Low-cost  
transportation  
in urban  
development





# LESSONS

## FROM THE FACTORY FLOOR

JAMIESON CAMPBELL

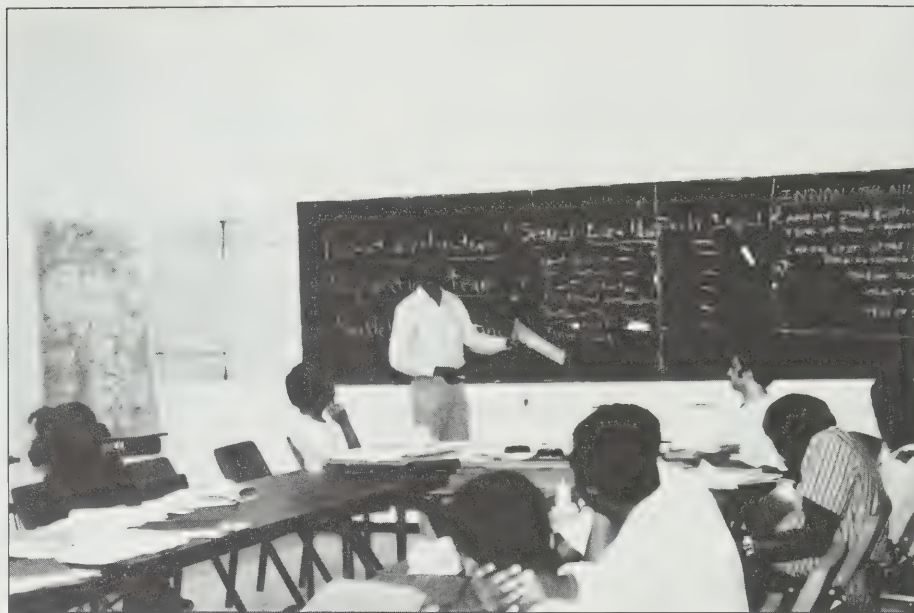
A cautionary history: In 1974, after foreign consultants identified a need for a cement factory, the heads of state of Nigeria and Benin signed an agreement committing the two countries to the establishment of a factory to produce 500 000 tonnes per year of ordinary Portland cement. Both countries were fully committed to the project before feasibility studies had been completed or the availability of raw materials had been confirmed.

A European cement manufacturer was invited to become the technical partner in the project, and to hold a 10 percent share of equity. Contracts for the design, engineering, and construction of the factory, as well as the contract for the monitoring consultants, were all awarded to European companies. Financing was arranged through a European bank recommended by the prime contractor.

In keeping with the agreement between the participating governments, a board of directors had been appointed to oversee the operation of the plant, but most of the members appointed were middle- or junior-level civil servants with no technical expertise. Too-frequent transfers and new appointments also created confusion.

After a number of setbacks, the factory was ready to begin producing cement in 1981. Unfortunately, the roads needed to transport the cement to markets had not been completed. When the project faltered, the European contractors used contract provisions to leave the two African governments to absorb costs and penalties.

Such an unfortunate situation must be viewed in the political and economic context in which it occurred, but a number of factors can be identified which can lead to the creation of similar "white elephants." These include reliance on foreign consultants and the absence of trained local personnel. A key factor is the relationship between policymakers — decision-makers at the political level — and researchers and



Workshop in Liberia: theory in the classroom and in action.

their products. All too often, there is no relationship. Decisions, even when they touch on strategic investments in key sectors of the economy, may often be made at a rarefied political level, without consultation with experts. Research designed to generate knowledge upon which rational choices can be made is clearly an important part of the process of economic development. More specifically, creating the research capability in the developing countries themselves is probably the key to long-run success in the area of technology policy.

Developing countries must build and expand the skills and experience of a cadre of professionals who can both draw on available research results and produce new knowledge to guide decisions about technology and development.

### THE WORKSHOP PROJECT

It was to address these concerns that IDRC began in 1977 to support a program of science and technology policy training aimed at strengthening the capacity of developing countries to manage the technology policy process.

The broad aim of the technology policy workshop project is to stimulate the interest of individual researchers in technology-policy-related fields, and to foster links between policymakers and researchers generating the information upon which decisions on technology policy should be based. The project's approach to the "transfer" of research skills in technology policy is to bring together individuals from the applied sciences and from the humanities, both from research and government.

The current series of four workshops based in developing regions follows work begun by IDRC in 1977 at the Science Policy Research Unit (SPRU) of the University of Sussex in Brighton, England. A key lesson learned from the SPRU experience was that workshops should be held in developing

countries, allowing participants to study problems where they occur and allowing a greater level of input from local instructors. The opportunity for firsthand observation of the industries and enterprises discussed in the academic literature was an important benefit to be gained from shifting the workshops.

Each workshop is itself an experiment in the teaching of skills related to technology policy. The project has been organized to permit constant evaluation by both participants and staff, who are seen by the organizers as part of a process rather than as a static activity. Dr Norman Girvan, as director and senior consultant to the project, draws on his experience as an academic and policymaker in Jamaica to ensure the process is one in which every workshop participant is a teacher and a source of information. Throughout the preparation and execution of the workshops, Dr Girvan cautioned both staff and participants against the "...natural temptation to regard the staff as the principal dispensers, and the participants as receptacles, of knowledge about technology and technology policy."

Each month-long workshop is organized around three main activities: lectures and group discussions; an intensive program of guided reading; and the completion of small research projects based on field trips to selected industrial and agricultural sites. Lectures and discussions are organized around a sequence of study modules or themes adapted to the particular features of the region in which the workshop is being held.

The study modules consist of a collection of journal articles and books, as well as unpublished papers and case studies, some prepared by researchers from the region. The module set consists of approximately 300 items, that vary according to the needs of the region where the workshop is being held. Many of the participants



## REFINED TECHNOLOGY SKILLS

Dr Augustine Smith, a young physics instructor from Sierra Leone and a participant in the technology policy workshop held in Monrovia, Liberia, in October 1982, is launching an examination of the process through which industrial workers acquire the skills that lead to a gradual improvement of production processes.

The innovations that can result from understanding—and trusting—the technology in use can lessen dependence on outside suppliers of technology. But this type of knowledge is seldom acquired through technology transfer arrangements unless it is actively pursued by the recipient.

With project assistance from IDRC,

Dr Smith plans to focus his research on the process of "learning by doing" he believes has taken place at the Sierra Leone Oil Refinery.

The refinery is a joint venture between the government of Sierra Leone and a consortium of multinational oil companies. The refinery is 50 percent owned by the government of Sierra Leone; 98 percent of its staff are Sierra Leone nationals. In its 12 years of operation the refinery has maintained a high level of performance, characterized by the management's success in solving problems.

Dr Smith believes that a substantial degree of technological capability has been acquired by the management and staff. He plans to investigate the degree to which technological capac-

ity has increased during the life of the refinery and to identify the conditions that have promoted or retarded the learning process.

Of particular interest will be the analysis of contract conditions established in the period prior to the investment in the project. Agreements signed during this stage of the project's development will have had a significant influence on the opportunities for learning incorporated in the operating stage of the enterprise.

The results of the investigation will provide much needed information and firsthand knowledge of how the process of technological skills acquisition can be promoted in developing countries.

have commented that the collection is one of the most valuable features of the workshop, and the materials are taken home to become the core of a technology-policy-oriented "mini library."

For the most part, workshop participants are well suited to the task of both observation and analysis. Chosen from more than 300 applicants, the 40 individuals who participated in the first two workshops represented a wide range of professions, disciplines, levels of seniority, and nationalities. In recognition of the multidisciplinary nature of the workshop, the selection committee endeavoured to select participants whose professional background, experience, and interests enabled them to make a contribution to the group and at the same time ensured that they could benefit from the training provided.

Felix Kani, for example, was a participant in the technology policy workshop for Eastern Africa, held in Arusha, Tanzania. Nominated by his employer, the Bank of Zambia, Mr Kani holds a degree in economics, and has worked for several years as an economist in the bank's research department. Partly as a result of his participation in the workshop, Mr Kani's department has begun organizing a small industries development program. Using some of the research skills developed in the workshop, and drawing on expertise within Zambia, the bank will now move forward with a program that it hopes will be able to identify and promote local entrepreneurs who are interested in investing or developing small-scale industries in Zambia.

A key part of each workshop is the preparation of a research paper based on the field visits. In the East African workshop held in April 1982, papers were prepared on the Small Industries Development Organization, which provides small industries in Tanzania with assistance in the form of equipment and training, and on a privately owned foundry and small-scale metal fabricating company.

In the first of the West African workshops, held in Liberia in October 1982, the research papers presented a critical analysis of the operation of several multinational corporations engaged in the extraction and concentration of iron ore, of the Firestone rubber plantation, and of a rural development project supported by the World Bank.

### GROWING CAPACITY

The effects of this series of technology policy workshops are likely to be felt over both the short and long term and at national and regional levels. It is hoped that, over the short term, workshop participants and their colleagues will form a core of people who will begin to apply their training more effectively to the very real problems of the use of technology in developing countries. Over the long term, and with the organizational assistance of their national research bodies, it is hoped that the relatively small number of people trained in IDRC workshops will form a "critical mass" of researchers and policymakers, whose interest and training will generate more activities involving others in their region.

There are signs of a growing capacity and interest in the conduct of technology policy research in the regions where workshops have been held. For example, the Institute of Development Studies of the University of Dar-es-Salaam, host of the Eastern Africa workshop, is now including technology policy research as part of its regular course of studies.

In West Africa, both the anglophone and francophone workshops are being co-hosted by the African Regional Centre for Technology (ARCT) and the Council for the Development of Economic and Social Research in Africa (CODESRIA). The ARCT is a good example of both capacity building and the intellectual and geographic "multiplier effect" of the training provided in the technology policy workshops. The

Director of Training at ARCT, Dr Paul Vitta, took part in the East African workshop as a participant, and in the West African workshop as an instructor. Partially as a result of his participation, Dr Vitta and the ARCT will organize their own series of six training workshops on technology development and transfer.

By the time the last two IDRC-supported workshops are held in Dakar, Senegal (April 1983), and Kingston, Jamaica (November 1983), it is hoped that the effects will be self-sustaining.

As Dr Girvan observed at the October 1982 Liberian workshop: "If you are talking about unpackaging (technology), you can have a nice discussion about unpackaging, but it is only when you go into a plant and see the production technology, and you breathe in the dust and you feel the heat, and you see the massive quantities of rock going in one end and the iron pellets coming out the other end that you begin to get a feel for what technology is all about." Although all of the workshop participants had responsibilities that required an intimate understanding of technology in its various forms, the workshops provided many of them with their first visit to the "shop floor."

By bringing together, in an intellectually stimulating environment, individuals who have relatively little experience, it is hoped that many more people will be persuaded to base research and policy formulations on visits to local manufacturing enterprises. After breathing in dust, and feeling the heat of the process, perhaps they will be able to make better policy recommendations on the use of technology for the development of their countries and regions. □

*Jamieson Campbell is Program Assistant to the science and technology policy workshops project at IDRC in Ottawa.*



*The first world conference on  
research and training related  
to women*

# WOMEN RESEARCHING WOMEN

LINE ROBILLARD HEYNIGER



*Women's work: researching inequality.*

**D**espite general acceptance of the principle, there has been little progress in achieving equality for women. In many cases there has, in fact, been regression. While a good inventory of the special problems of women in most countries does exist, what is missing is an understanding of the root causes that further research can help to provide.

The need for more research on women was emphasized at the Copenhagen United Nations World Conference on Women in 1980. The need for a conference devoted exclusively to research and teaching on women's issues was again recognized at the Nongovernmental Organizations Forum in Copenhagen. A series of meetings confirmed the worldwide interest in this field of activity. It also showed that specialists were isolated within their own institutional environments or countries, that contact between countries was extremely limited, and that communication of any kind was haphazard. This was in spite of the fact that a great deal of research of worldwide value was being done, and teaching programs that could serve as models were being established. A truly international conference — the first on this subject — was seen as the means to pursue this dialogue, gain further acceptance of the field, and establish the basis for ongoing communication among practitioners.

Between July 26 and August 4, 1982, 350 women from 71 countries met at Concordia University in Montreal, Canada, for the first International Conference on Research and Teaching Related to Women. For the organizers, based at Concordia's Simone de Beauvoir Institute, the meetings marked the culmination of 20 months of effort. For the participants, they provided a unique opportunity to make contact with their colleagues, gain insights from the experience of others, and lay the foundation for future exchanges.

Making the idea a reality presented the twin challenges of initiating action, and of doing it in the area of women's affairs, where there is a perennial scarcity of resources. In

addition, there were special problems related to participation, financing and programing.

## SPECIAL CHALLENGES

For the conference to be truly international and to make a significant statement on the general state of the art, it was essential that specialists from as many countries as possible be

contacted and that there be a good geographical balance among participants. In the absence of any roster of researchers on women's issues, it was decided to appoint liaison committees or contact persons in various parts of the world who could publicize the conference and draw up a list of potential participants on a regional basis. It was understood that individual specialists would participate in their own right, not as representatives of institutions or organizations.

Operational funding had to be obtained for the entire project. It also became clear that travel grants were needed. Without them, the desired geographical representation could not be achieved. The Canadian host university, Concordia, could only provide seed money and some administrative support. Fund raising therefore became a major preoccupation.

The Ford Foundation provided a generous grant early in the project, allowing work to start. Support gradually came from other sources, including the governments of Canada and Quebec, development agencies from Canada, the Canadian International Development Agency (CIDA), France, the Netherlands, and Sweden, and Unesco. The IDRC provided both travel funds and technical advice through its Social Sciences and Information Sciences divisions. In the end, sufficient funds were raised to cover conference expenses and to provide approximately 70 participants with full or partial travel grants.

While highlighting common interests, the main objectives of the conference also had to reflect the interests of



specialists from various economic and social backgrounds. In the absence of any precedent, it was decided to consult as many specialists as possible before finalizing the program: questionnaires were sent out worldwide, meetings were held with scholars from nearby universities, and every opportunity was taken to consult experts.

On the basis of those discussions, the main objectives of the conference were defined as follows: to provide an international forum for discussion and exchange on teaching, research, and associated issues relating to women; to reinforce newly created research centres and women's studies groups throughout the world; to recognize and enhance the contribution of teaching and research on women to social and economic development; and to facilitate the establishment of networks at all levels.

The final program did not attempt to include all proposed subjects, but rather sought to identify questions of interest to all, regardless of background and priorities. Because the conference was a first and the field is in its formative years, the program emphasized questions of definition and methodology. Experts needed to introduce themselves, test their assumptions, and discuss conceptual approaches. The major plenaries were devoted to conceptual approaches to research, conceptual approaches to teaching, and research and social action. In addition, one plenary addressed practical issues — resources available for research and teaching related to women, communication, information-sharing, and networking after the conference. Following that plenary, participants were invited to discuss regional follow-up activities in special workshops chaired and organized by a representative of each region.

#### A PRELIMINARY EVALUATION

Given its stated objectives, the conference was extremely successful. Not only did women from 71 countries attend, but the desired balance in regional representation was as good as could possibly be achieved, with 45 participants from Asia/Pacific, 49 from Africa/Middle East, and 41 from Latin America/Caribbean. There was great excitement on the part of the participants just to be together, as for many it was the first opportunity to attend an international meeting.

Pending the final report, it is possible to draw a few general conclusions and highlight recurrent themes.

It is clear that priorities and, to a certain extent, methods vary greatly between researchers from different countries. In fact, researchers from developing countries warned against the myth of the universality of women's condition that has misled several Western researchers working on women's

issues in development.

There is, however, a common purpose and spirit among these experts, who are moved by a desire to improve the situation of women and of society as a whole. They look to the future and shed a new light on current issues that provides a different vision of society. They are fundamentally creative, questioning accepted methods, seeking new approaches, re-examining concepts and premises. The real value of their research lies in the new questions raised and the new interpretation given to existing data.

Research on women is seen as an integral component of a three-part global phenomenon consisting of research, social action, and grass roots women's groups, each component reinforcing and in constant interaction with the others. This close linkage between action-oriented components opens up new avenues to interpretations and methods. Participatory

research, for example, redefines the relationship between researcher and researched, as it involves the women themselves in the solution of a problem that they have identified through research.

There is great concern with the need to bring the findings to the attention of policymakers. Special strategies have been developed, with some success, both to transmit the information and to provide tools with which the new ideas can be received and implemented. Such a tight interaction between researchers, activities, and policymakers implies a strong personal relation between the researcher and the society in which she operates. This in turn points to the need for a decentralization of activities and the development of local research capabilities.

Given the scarcity of resources and the common nature of some problems, the need for sharing information was also stressed. As a first step, it was suggested that a system be established to provide information on who is doing what, and where. The IDRC is financing the preparation of *An annotated directory of researchers and educators on women* to be published by the Simone de Beauvoir Institute. It will form the basis of a continuing, updated directory service on a regional basis.

Networking at the regional level was seen as an immediate need. In fact, the regional meetings at the conference were one of the most popular aspects of the program, and almost all regions organized several supplementary meetings, making maximum use of this rare opportunity to meet with colleagues and to discuss possible follow-up.

The Asian group took top honours with a total of five meetings, by the end of which they had established an association — the Asian Women's Research and Action Network (AWRAN). The African and the Latin American groups left with plans to reinforce their existing associations — the Association of African Women for Research and Development (AAWORD), and the Latin American and Caribbean Association for Women's Studies (ALACEM). The European group, which still lacks a formal network, was prompted to look for means of constituting one very shortly.

There is no doubt that the Montreal conference will be seen as a landmark in the development of research and teaching on women's issues. Its participants left hoping to meet again in 1985 in Nairobi, Kenya, at the United Nations Conference that will mark the end of the Decade on Women. There they will report on what progress they have been able to make in their respective regions since 1982. □

*Line Robillard Heyniger, a consultant based in Montreal (Canada), was coordinator of the Conference on Research and Teaching Related to Women.*

## THE NETWORK

**Africa:** Association of African Women for Research and Development (AAWORD)/Association des femmes africaines pour la recherche et le développement (AFARD)

c/o Marie Angélique Savané  
B.P. 3186, Dakar, Sénégal

**Asia/Pacific:** The Asian Women's Research and Action Network (AWRAN)

C/O PILIPINA  
Social Development Index  
12 Pasaje de la Paz  
Project 4 Quezon City  
Philippines

**Canada:** Canadian Research Institute for the Advancement of Women (CRIAOW)/Institut Canadien de Recherches pour l'Avancement des Femmes (ICRAF)

151 Slater Street, Suite 415  
Ottawa, Canada K1P 5H3

**Latin America and Caribbean:** Latin American and Caribbean Association for Women's Studies (ALACEM)

c/o Fanny Tabak  
Nucleo de Estudos sobre a Mulher  
Pontifícia Universidade Católica do Rio de Janeiro  
Rua Marques de São Vicente,  
225 Gávea  
Cep 22453  
Rio de Janeiro RJ, Brasil

**U.S.A.:** National Women's Studies Association (NWSA)

Social Science Bldg. Rm. 0218  
University of Maryland  
College Park, Md. 20742, U.S.A.



## BIOTECHNOLOGY, FOOD, AND BRAIN BANKS

M.S. SWAMINATHAN

**T**he manipulation of the biological system — biotechnology — and its recent offshoot, genetic engineering, have attracted considerable public and political interest because its breakthroughs have great potential in the fields of agriculture and health.

One technique, tissue culture, has been called "the botanical equivalent of the laser, in that there are more potential applications than originally conceived." The vast panorama of possibilities for the use of such techniques in agriculture, animal production, fisheries, and forestry is just unfolding.

Developing countries naturally want to avoid technological obsolescence and profit from the most recent advances in technology. They are thus attracted to the potential of biotechnology to solve problems of hunger, energy supply, and quality of life.

The precise priorities of these countries naturally vary widely, of course. The National Institute of Biotechnology and Applied Microbiology in the Philippines, for example, has accorded priority to research on biological fuels, nitrogen fixation by crops, food fermentation, production of antibiotics, vaccines, and microbial insecticides, and biomass production. India's National Biotechnology Board has chosen genetic engineering, photosynthesis, tissue culture, enzyme engineering, alcohol fermentation, and immuno-technology as areas of immediate interest.

Nearly all developing countries have plans or programs for harnessing biotechnology for their national development. It is important, therefore, that a realistic understanding of the problems and potentials associated with biotechnology research becomes widespread.

Food is the first need of humans. The world as a whole has been able to keep food production slightly above the rate of population growth, thanks in large part to new technologies leading to the development of high-yielding varieties of wheat, rice, and other major food crops.

The diminishing land resource for crop production is an important constraint. Farms in many Asian countries are shrinking under expanding population and demand for land. In most states of India, for example, the average size of a farm holding is less than one hectare. Increases in food production will thus have to come largely from increases in productivity and greater cropping intensity on land already under production.

This is where high-yield technology is of particular relevance. For example, in the Philippines, an additional 3.2 million hectares of cropland would have been needed to achieve the 1980 rice production level, had the high-yielding rice varieties not been developed in the 1960s. In India, over 34 million hectares of additional land would have been needed to produce the quantities of rice and wheat the country harvested in 1979, had it not been for the productivity advances made since the mid-1960s.

In spite of this impressive progress, the vulnerability of world food production systems, particularly to weather conditions, is very great. The UN Food and Agriculture Organization (FAO) study, *Agriculture: Towards 2000*, has shown that for the 90 developing countries as a group, the net cereals deficit of 36

million tonnes in 1978-79 will be doubled by 1990 and doubled again by 2000.

Can we integrate appropriate components of emerging technologies with traditional ones to find speedy and effective solutions to the problem of undernutrition and malnutrition?

Developing countries face the dilemma of having to improve both production and consumption simultaneously. Given the prevailing economic conditions in many countries, this will be possible only if the cost of production is kept as low as possible so that the sale price is within the means of a majority of consumers. The challenge to those in charge of technology development is to bring about a continuous improvement in productivity per unit of land, water, time, and energy without detriment to the long-term production potential of soil.

Can biotechnology help in this task?

### BIOTECHNOLOGY AND RICE

The FAO has projected the need for an additional 300 million tonnes of paddy (threshed, unmilled rice) during the last quarter of the century. Unlike other cereals, the demand for rice will remain overwhelmingly for direct use as human food.

Through an expansion in the area under irrigation and through productivity improvement, it should be possible for developing countries to meet 200 million tonnes of the additional demand. It takes several years of breeding work to produce a commercially popular variety: The breeding of IR36, which is now planted in over 10 million



hectares in Asia, for example, took about seven years. Another two to three years is needed to produce sufficient seed to cover large areas. Thus, food production in the late 1980s will have to depend largely on the material already in the plant breeders' assembly line. The immediate task of research and development establishments should be to bridge the gap between potential and actual yields in small farmers' fields, by helping to eliminate the constraints that create this gap. Any new research program planned and initiated now will have delayed effects, increasing and stabilizing production only in the 1990s.

Yield improvement and nutrient supply in rice are areas of research where tissue culture and genetic engineering could be of great value. Even though basic techniques of biotechnology have been developed and known in the past, the application of these techniques to crop improvement is a new avenue of research.

Among various tissue culture techniques, the induction and selection of useful mutants is probably the most promising. At the International Rice Research Institute (IRRI), work on salt-tolerant varieties of rice is now under way. Work on high-lysine and high-protein rice will soon be initiated. Disease resistance can also be increased by tissue culture.

Incorporation of nitrogen fixation genes into rice by genetic engineering is the most ambitious project. This will help the rice plant to fix its own nitrogen from the air, eliminating the need for expensive chemical fertilizers. We now know that at least 17 genes are

involved in the nitrogen fixation system. We still do not know if the manipulation of such large numbers of genes will be possible.

Wetland rice is quite suitable for biological nitrogen fixation. Nitrogen is being fixed in wetland rice soils by biological agents such as blue-green algae, azolla water fern, and nitrogen-fixing bacteria.

Soil inoculation with blue-green algae is widely used in Egypt, India, and Burma. Preparation of inoculum is a well-developed small-scale village biotechnology. Yet, little is known about the actual mechanism of rice yield increase due to blue-green algae inoculation. This is an urgent area of research.

Recently, the potential of the azolla fern as a nitrogen-fixing crop suitable to rice culture has been recognized by many researchers. If we could cross azolla species, the improvement of strains would be much promoted.

None of these nitrogen-fixing systems can become the sole source of nitrogen in rice cultivation. Combinations of possible sources should be used depending on local environmental, cultural, and social conditions. For example, azolla is more suitable to double cropping of rice in irrigated areas than in rainfed areas. In contrast, blue-green algae can be easily used in rainfed areas.

Scientists at IRRI believe that the strengthening of existing systems of interaction between nitrogen-fixing bacteria and rice roots would be the most feasible way to increase nitrogen fixation of rice and thereby enhance production. As the living root is inhabited

by tens of millions of bacteria, genetic engineering techniques would be worthy of attempt.

Tissue culture techniques can also help to standardize breeding of perennial plants such as coconut, rubber, and quick-yielding fuel trees. Coconut palms, for example, suffer from diseases of unknown causes such as *cadang-cadang* in the Philippines and root wilt in India. But in the midst of severely infested plantations, healthy, high-yielding palms also occur. The propagation of these disease-resistant and high-yielding palms through tissue culture would be of particular value.

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#### BANKING BRAINS

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So far, institutions like the World Bank and the Asian Development Bank have been established to render financial support to worthwhile development projects. We now need to think about the organization of "brain banks" to provide countries with objective and up-to-date advice on technology choice and transfer. This has become particularly urgent because of the growing commercialization of skills and know-how, and the growing secrecy surrounding discoveries.

To be successful, the brain banks will obviously need the support and guidance of leading scientists and technologists who are not only authorities in their respective fields of specialization, but are also humanists.

Institutions in developing and developed countries can also enter into twinning arrangements to maximize the benefit from their complementary strengths.

Likewise, individual scientists can collaborate on projects of mutual interest. Simplified administrative procedures and appropriate financial support mechanisms will be needed, however, to foster such collaboration.

Periodically, seminars should also be held for policymakers and political leaders to familiarize them with new developments in biotechnology and help them to make investment decisions.

Several ideas, including the setting up of international and regional centres, are now being considered by the UN and other organizations. Immediately, a modified version of the TOKTEN scheme (Transfer Of Know-how Through Expatriate Nationals, in which scientists, engineers and other specialists working abroad are invited to return to their home countries) will be useful. The TOKTEN scheme needs to be broad-based in fields such as biotechnology, so as to perhaps include not only expatriate nationals but also other appropriate experts.

The opportunities now available for integrating emerging and traditional technologies in fields such as biotechnology, microelectronics, computer science, and satellite imagery and communication need to be explored. It is through the planned and purposeful integration of the old and the new that we can sow the seeds for sustainable development. □

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*Prof M.S. Swaminathan is the Director-General of the International Rice Research Institute in the Philippines.*





1983

*Electronic media  
rely on people  
for effective communication*

# THE MEDIUM IS THE PEOPLE

T.E. VOIGT

Video and radio are two powerful communications media which, when backed up by the right people, can transform a community. The small village of Taprana in northern India, for example, is pervaded by a feeling of pride these days, where once it was looked down on by neighbouring villages. It now has two thriving co-operatives — dairy and mushroom operations. And rickshaw pullers own rather than rent their vehicles.

The catalyst for this development was videotape. Like its sister technology, radio, videotape has been used successfully in a number of rural projects in the Third World.

In the case of the dairy, discussions among neighbouring farmers already involved in a cooperative were videotaped to spark the interest of Taprana's villagers and to provide the necessary know-how. The tapes focused on issues of quality control and pricing, as well as the iniquitous relationships with milk pedlars who pay a token sum for village milk, then water it down and sell it.

For this video technique to be an effective teaching aid, says Don Snowden, a development educator at Memorial University in Canada, who led the Taprana project, it is essential

*1983 is World Communications Year. During the year, the world community is being asked to develop an awareness of the importance of transportation and communications.*

*As the former Secretary-General of the International Telecommunications Union, Mohamed Mili points out, "Two-thirds of the world is inadequately served and a large section of its population is literally unreached by any type of communications infrastructure and left virtually incommunicado!"*

*In keeping with the theme of the year, "development of communications infrastructure," we present two different approaches to reaching people in developing countries. "The medium is the people" on this page describes how communications technologies can be applied to support development. On page 24, "The science of writing" presents one of a series of workshops aimed at building up an indigenous capacity to communicate.*

that the people on tape be the viewers' peers. They should look the same, live in similar circumstances, and use the same dialect.

"With any technology, you must have very good resource people working on the ground with the farmer if you hope to have any success at all," he adds.

Video and radio are expensive media, often cumbersome, and usually alien to a community. As a means of communication they are also less community-oriented than traditional drama, puppets, flannel display boards or street theatre.

Yet the Indian video project has been successful. So are a radio-cassette combination used by a Catholic priest in Ecuador and a worldwide

farm radio network run by a Canadian broadcaster. These, and similar projects, can probably trace their effectiveness to one common ingredient. Each recognizes the key role of people and their traditional knowledge in communication.

Snowden's Indian project, jointly sponsored by the Canadian International Development Agency (CIDA) and Memorial University of Newfoundland in Canada, began with a phone call from the National Dairy Research Institute (NDRI) in India. A scientist there had heard of his work with video

in the Canadian North and requested help in reaching isolated Indian farmers with video equipment already in stock at NDRI. The technology coincided with what Snowden had used when he first experimented with video; his method uses animators to help community members identify and discuss their own problems.

The NDRI agreed that the project should go beyond animal production to include other concerns of the villagers. Another plus, says Snowden, was that the Institute had the two kinds of expertise essential to this kind of project. "I have always believed one has to make a clear distinction between technical people and animators," he explains. "Technical people are not



good animators. It requires cooperation between a minimum of two people — one who understands village education and the village situation, and another who understands the equipment."

He found both at NDRI. The head technician of the Institute went to Taprana with a community worker. During the day they taped activities and in the evening played it all back.

"There were hundreds of people sitting in front of the video," Snowden remembers. "They were in the one neutral place in the village, just a bare area where all the people pass through. Right away, the experience was not threatening. Indeed, it was joyful. Many of the villagers had never seen a moving image, let alone a moving image with anybody they knew on it."

After this initiation to the electronic world of video, the people then watched a more specific tape from another village. This was followed by a discussion on how they themselves might use video.

The first village video program was unrelated to dairying. It recorded conversations with rickshaw pullers who needed to borrow from the Bank of India. Prior attempts had gone nowhere.

Community workers videotaped the rickshaw pullers explaining why they felt they met the bank's loan criteria. They played it back for the local bank manager, who replied on tape that he had "learned a great deal" and invited the rickshaw pullers to see him... Now, for the first time in Taprana, pullers own their rickshaws and all but two of the loans have been fully repaid.

The rickshaw-financing scheme encouraged the villagers to use video to launch the cooperative dairy. That success, in turn, led to the formation of the mushroom-growing cooperative.

THE NETWORK GROWS

Manuel Calvelo Rios of Peru also believes in the power of video communication. As with the Indian project, and a similar IDRC-supported project in Haiti that used video to improve agricultural extension services (see *Reports* 9(4), January 1981), he has used video to help farmers increase agricultural production.

Rios works in cooperation with the UN Food and Agriculture Organization (FAO) and the UN Development Programme (UNDP), through the Centre for Research and Training in Agrarian Reforms (CENCIRA), within which he has created the Centre for Production of Audio-visual Aids for Training (CEPAC).

Begun in 1977, the project is staffed by 40 young men and women — average age is 24. At the outset, none was familiar with video. Rather than use TV stations and communications schools, the project leaders decided to train

half a dozen people themselves, letting graduates in turn train their peers.

"The quality of output is not to be compared with that of broadcasters, as that is irrelevant to the needs here," says Rios. "We define the quality as being good if it is useful for the peasants."

One of the first courses the team produced dealt with lemon cultivation. Peasants were complaining that the output of their trees was too low.

"We went to a university and brought along a technician and showed him the problem," explains Rios. "It was discovered that a seven-year-old lemon tree was getting only the same amount of fertilizer and care that it got when it was a sapling. The peasant was told an alternative technique was required."

The experience was put into a six-day audiovisual course, with only one concept per lesson. This was supplemented by practical instructions in the field.

"When we visited this area three years later, we saw that the productivity of the trees was increasing," says Rios, acknowledging that it is still too early to evaluate the video project's overall agricultural impact.

Like video, "radio for motivating farmers has to be a tool used with an extension worker," says Wendy Quarry, an IDRC study-award-winner specializing in development communications. "Radio in a vacuum, radio without feedback, is no good — unless you

Barriga's first broadcast in late 1972 was a self-conscious and stilted effort. In less than two weeks, however, villagers began to feel at home with the medium and the quality of the programs improved. One recording of a community housebuilding project, for example, included the sounds of hammers in the background while workers individually discussed their progress and needs. Within a few months, a general meeting of the *auxiliares* brought unanimous appeals for more air time.

FARMERS ON AIR

Broadcaster George Atkins of the Developing Countries Farm Radio Network (DCFRN) based in Toronto, Canada, also uses radio for rural development, but his approach is different. "The idea of the project is to let grass roots farmers around the world talk about their solutions to problems so that we can share this information through radio with other farmers suffering similar setbacks elsewhere in the world," Atkins explains.

"In Botswana, for example, farmers mix ashes with their grain to keep the weevils out. Farmers had never heard of this in West Africa, or in Thailand, or Chile, or Mexico. So, here is a very simple, effective technique that we put into our programs. And now a hundred million listeners around the world can hear about it."

At present, Atkins' material is "broadcast" rather than "communicated," as there is no direct feedback mechanism built into the project. He is, however, discussing the possibility of introducing a rural forum component.

Initially sponsored by a public service grant through Massey-Ferguson Ltd., the project now has backing from the University of Guelph in Canada, and CIDA. Recordings are broadcast in 103 countries around the world.

Twice a year Atkins travels the world gathering agricultural tips from farmers. A package of 9 to 12 items goes to all radio station subscribers in the form

of scripts, illustrations, and a cassette recorded in English, French, or Spanish. Users also receive a newsletter that includes a "professional improvement" page for the broadcaster and suggestions for getting the material across to farmers.

Although experts disagree on which rural development project warrants which communications medium, those involved in rural development can certainly lighten their task by tapping the instructive potential of electronic media — radio, video, or both. □

T.E. Voigt is a freelance writer specializing in development communications subjects.



The global village becomes a reality as electronic communications spread. Tuning in on development messages becomes the challenge.

blanket the airwaves with agricultural ads."

She points to an example in Tabacundo, Ecuador, where the personal energy and enthusiasm of *auxiliares*, unpaid nonprofessionals from local communities, have helped create a phenomenon known as *Radio Mensaje*.

The project is the brainchild of Padre Isaias Barriga. He used a small grant from the University of Massachusetts (U.S.A.) to distribute simple cassette recorders to volunteers in isolated villages. They were asked to collect material which, when edited, would be broadcast on Barriga's radio station operated out of his church.



# THE SCIENCE OF WRITING

BOB HUGGAN

**S**ixteen journalists from six South-east Asian countries took part in the third in a series of international workshops in development science writing supported by IDRC's Communications Division. Held November 22-December 1, 1982, at Silliman University, Dumaguete City, Philippines, the workshop was organized by the university's School of Communication and the Manila-based Press Foundation of Asia (PFA).

Journalists from Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, and Thailand joined two senior students from the School of Communication and IDRC's regional liaison officer in Singapore for 10 days of intensive, practical training and discussion of science journalism in development. University faculty, and staff from PFA and IDRC Canada served as resource persons.

Field trips presented firsthand opportunities to observe science and its effects. As in the previous two workshops in Dakar, Senegal, and Nairobi, Kenya (see *Reports* 10(3) and 11(2)), the journalists treated each presentation or field visit as a press conference and wrote news or feature articles on several of them. The articles were edited and critiqued by the resource persons, then returned to the participants.

The journalists' reaction to the content and organization of the workshop was much more widely varied than in the two African workshops. This was due, in part, to a weakness in the participant selection process that resulted in some of the journalists being relative beginners while others were seasoned practitioners.

As in the previous workshops, an important additional benefit was the opportunity for journalists to exchange information and opinions on the often widely varying editorial approaches of the media in their home countries, and on the need for more reporting on science and technology for development.

Although no dates for future IDRC-sponsored science writing workshops have been set, French-speaking Central Africa, the Caribbean, Latin America, and South Asia are possible locations.

The articles that accompany this report were written by three of the workshop participants as newspaper feature articles. The names and addresses of all participants can be obtained from Michael Graham, Regional Liaison Officer, Communications Division, IDRC, Tanglin P.O. Box 101, Singapore 9124.

*Bob Huggan is Deputy Director of IDRC's Communications Division.*

*Geothermal energy in the Philippines generates new hope for some of the poorest*

## FIRE DOWN BELOW

ADI IGNATIUS

Among the coconut trees and banana patches high in the hills above one of the poorest areas in the Philippines lies what may be the answer to the growing energy needs of the Visayas, the group of islands that forms the country's central region.

It is there, at Palinpinon on Negros Island, that large underground reservoirs of hot water (up to 320°C) and steam — geothermal energy — are being tapped to produce electricity. By 1986, the field will provide some 230 megawatts (MW) of power to local users. And, according to the project's senior consulting engineer, New Zealander Angus Brodie, "We're still just picking at the edge of the resource."

Geothermal energy is already being tapped to provide electrical power to consumers in other parts of the Philippines — at three fields in Laguna and one in Leyte. The combined power output of these areas now stands at 443 MW, making the Philippines the world's second largest producer of electricity from geothermal energy after the U.S.A.

The Philippines government hopes to add another 1033 MW of installed generating capacity by 1986 from new areas such as Palinpinon.

Just how is electricity produced from geothermal energy? Essentially, it is the harnessing of the underground hot water and steam to turn turbines.

The hot water begins as rainwater that seeps through fractures in the strata under the earth's surface and is heated by extremely hot molten rock (magma) deep below the surface. In Palinpinon, the magma is relatively close to the surface as a result of past volcanic activity.

The magma's heat radiates through the water-containing rock layers above



*Tapping into underground steam and heat to generate power in Palinpinon.*



it. As the downward-moving water is heated, it expands and moves back up toward the earth's surface. Some of the heated water is trapped between layers of rock and circulates in reservoirs.

By drilling with rotary rigs, like those used in the exploitation of oil and gas, these hot water reservoirs can be tapped, and the steam produced piped to power plants to generate electricity.

At Palinpinon, two 3-MW pilot plants are now in operation, their combined output of 6 MW being fed through existing transmission lines to Dumaguete City, the nearby capital of Negros Oriental province. Even this small supply, however, has overloaded the old transmission lines of the small city, triggering almost daily brownouts during peak-use hours. New transmission lines are presently being installed.

In the meantime, construction is moving ahead on the first of two planned 112.5-MW power plants, Palinpinon-I, to provide electricity throughout Negros Oriental. Its first unit of 37.5 MW was expected to begin commercial operation in March, this year, and to be fully operational by November 1983.

Construction of the second 112.5-MW-capacity plant, Palinpinon-II, will begin this year. Engineers at the site say that this plant should be operational by 1986.

An innovative aspect of the Palinpinon development, Brodie says, is the use, for the first time in geothermal exploration, of directional drilling. This technique, used extensively in oil and gas exploration, allows the driller to bend and turn the direction of the drill underground, instead of simply boring a vertical hole.

Directional drilling is more expensive than vertical drilling, but has been found by drillers at Palinpinon to be useful in the rugged mountain terrain. Underground reservoirs as far away as 1.5 km in horizontal distance can be explored without the expensive, time-consuming, and environmentally damaging technique of transporting the heavy rigs through the mountains, clearing land, then moving the rigs to a new area.

Key environmental considerations are being addressed in the Palinpinon geothermal development. For example, once water and steam are extracted, the mixture is piped to a separator and the steam is sent to a power plant. The remaining water cannot be discharged into the local environment because it includes potentially dangerous chemicals leached from underground rocks. Boron, in particular, is a danger to the rice fields that lie at the base of the mountains. Its discharge is limited by law to just two parts per million in the Philippines.

To avoid environmental contamination, water at the field is reinjected into the underground reservoir. The result, say geologists at Palinpinon, is that the geothermal project is almost pollution-free. However, because the piped

water at the plant contains as much as 60 parts per million of boron, a rupture could be extremely damaging to crops downstream.

Another potential environmental danger is the release of hydrogen sulfide ( $H_2S$ ) from escaping steam. When  $H_2S$  mixes with water in the atmosphere, it can produce dilute sulfuric acid (acid rain). This is particularly critical at Palinpinon where mountain cloud cover often drops as low as the wellheads. Geologists at the site say that the amount of  $H_2S$  emitted is now at "a safe, minimal level," but when the two large plants come on line it will

be necessary to monitor the level closely.

The two plants may only be a start for geothermal development at Palinpinon. Brodie, who has 10 years of experience as a geothermal engineer in New Zealand, estimates that the entire resource area may be 50 km<sup>2</sup>, with a potential output of around 1000 MW. If Brodie's estimate is proven accurate, it would make Palinpinon the largest steam-water geothermal reserve in the world. □

*Adi Ignatius is managing editor of Asia 2000 magazine, Hong Kong.*

## THE HELPING HAND

### GOH SIEW CHING

"What can I do about the worms in the cabbage?"

The question that launched integrated rural development in the southern part of Negros Oriental province, in the Central Philippines, came from a village woman. It was directed at Dr Fe Sycip-Wale, whose sole commitment at that time — the late 1960s — was to promote maternal and pediatric care in that very depressed region of the province.

Negros Oriental was said to be the most backward province in the Philippines in the 1960s. And Dr Sycip-Wale, a pediatrician with Silliman University, had organized "mothers' groups" to discuss health problems in some of the most poverty-stricken villages dotting the province.

"The person who asked that question was not even sure she should ask it," Dr Sycip-Wale recalls. "She apologized that the question was not related to health, but stressed that it was very important to her. It was then I realized that if we were to respond to what the villagers really wanted we would have to help them in matters other than health." And so the *mothers'* groups became *parents'* associations, concerned with all kinds of community welfare and involving both men and women.

These associations led to the founding of the HAND (health, agriculture, nutrition, and community development) program in 1972 by Dr Sycip-Wale at the Marina Clinic in the Negros Oriental town of Dauin. The privately funded clinic is today part of the extension program of Silliman University, in nearby Dumaguete City.

"What we have been doing here has not been easy," Dr Sycip-Wale says, "but we have gained the confidence and the trust of many *barrios* (districts) in the area. And this, I have learned, is the first step to promoting and providing primary health care to people who have been deprived of these

services."

In an average month in 1982 some 260 people were treated at the clinic. Of these, more than half came in for consultation, Dr Sycip-Wale reports, and the rest were follow-up cases. But while the clinic is the most visible project in the HAND program, the main outreach to the rural communities has been the HAND outposts established in nine of the 21 *barangays* (villages) in Negros Oriental since 1972.

These outposts are tiny shacks erected by the villagers themselves to house the clinics — and sometimes the medical staff. These front-line clinics are staffed permanently by health workers trained to handle simple complaints such as coughs and colds, and to recognize more serious ailments that need referral to doctors. They also handle "simple injections," according to Dr Sycip-Wale.

The clinics are self-supporting, being funded in most cases from cooperative stores staffed and managed by the villagers themselves. It is also at these clinics that people meet to discuss other problems with agricultural workers, nutritional experts, social workers, and other personnel from HAND teams. Because much of the success of such centres depends on the villagers themselves, leadership training programs have been included in HAND efforts.

"I don't want to give the impression that it's all a bed of roses," says Dr Sycip-Wale. "There have been problems, mainly with funding.

"Five of the nine cooperatives started are not fully active. But the other four are managing well enough to pay the medical workers and buy the bulk of the medicine they need from their own profits."

The latest development, in the *barrio* of Bolok Bolok, is the establishment of a pre-school program for the children of that area. "You see, we cannot predict how development will move,"



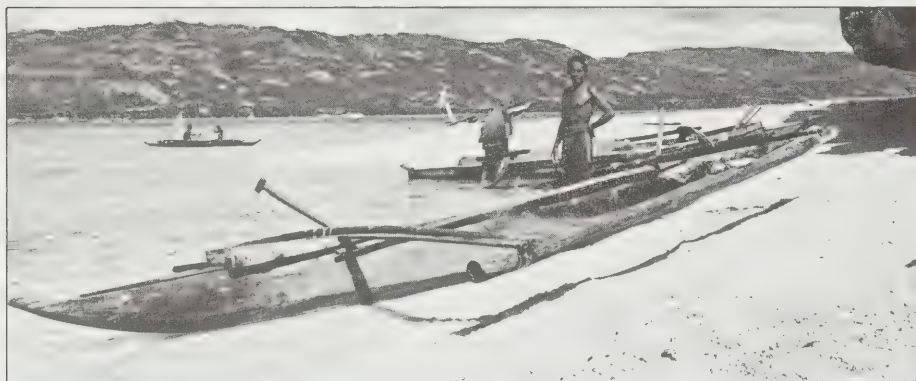
says Dr Sycip-Wale. "All we can do is provide as much expertise as possible to meet the needs of the people at a level acceptable to them." And with this principle strongly adhered to, the HAND program has been expanding — although slowly and often "unsurely."

It continues to train traditional midwives in aseptic deliveries; to develop drinking water projects at village level; to preach an unending sermon on the values of nutrition; and to do the "dozens of things coming under the umbrella of HAND objectives," according to Dr Sycip-Wale, who stresses that community development demands time,

patience, commitment, and funds.

It has been almost 20 years since the first "mother's groups" were launched. Since then, Negros Oriental has moved from the bottom rung on the "most depressed province" ladder to third from the bottom. Not a dramatic move, and Dr Sycip-Wale does not claim that her HAND program is fully responsible for this advance. But the work being done at the Marina Clinic and at the *barangay* outposts plays its part — an important one — in such progress. □

*Goh Siew Ching is a reporter for the New Straits Times, Kuala Lumpur, Malaysia.*



*Sumilon: more than a paradise.*

## TAKING IN A REEF

LILLIAN CHEW

When it comes to preserving the environment, Dr Angel Alcala lets nothing stand in his way — not even blood. He once threatened to put his relatives in jail when they proposed cutting down some trees in a protected forest.

Angel is an appropriate first name for one who has spent a great deal of his 53 years working to protect and preserve the Philippines' natural heritage of forests, animals, fish, and corals. But to some local government officials, fishermen and industrialists, this Angel is a devil.

Dr Alcala is one of the Philippines' leading environmentalists. A marine biologist by training, he is Vice President for Academic Affairs at Silliman University, Dumaguete City, and has a particular passion for the sea and the life within it. He was the prime mover behind the Philippines' first marine sanctuary at Sumilon Island, in the Central Philippines.

Sumilon is a pretty island — not much ground cover, but sparkling white and surrounded by the clearest of blue waters. It fits neatly into most people's conception of a tropical paradise. It's also a diver's dream: cascading, colourful coral gardens, seemingly untouched, with thousands of fish in electric colours.

But to Dr Alcala, and to the many Asian conservationists who watch what's happening there, Sumilon Island is more than just another tropical paradise. It is an experiment in marine conservation, a place that could yield

results upon which future regional marine conservation policies could be framed.

Relevant data are the lifeline of any ecological movement, says Dr Alcala. It is no use making emotional appeals to governments to stop destroying Asia's natural habitats without being able to show specifically that destroying the environment is contrary to improving the welfare of the people — at least in the long run.

For instance, studies done at Sumilon Island have shown that protecting 20 percent of the coral reef as a fish sanctuary is sufficient to maintain the fish productivity in the other 80 percent. Dr Alcala maintains that "in this instance, it has been made clear that sustained yields are possible, at least for a three-year period of study, if a breeding stock in a portion of the habitat is protected."

This is particularly important because coral reefs are key breeding areas for fish in the tropics. Composed of organisms that resemble both plants and animals, the reefs are home for hundreds of species of fish. Unfortunately, the reefs have been subject to widespread destruction — by fishermen who use everything fromammers to bombs to clear away the coral to get at the fish, and by others who mine the reefs to provide lime for industry and trinkets for tourists.

"At Sumilon Island, the fish yield has been 15 to 20 tonnes per km<sup>2</sup> per year for the last three years," says Dr Alcala.

"This is two to three times higher than that obtained from most waters around the world. Of course, where coral reefs have been destroyed, the fish yield is zero."

Research at Sumilon also aims at finding out how fast coral grows, and how fast the whole reef regenerates.

When Dr Alcala speaks about the problems involved in protecting more reefs in Southeast Asia, he does not take the easy route of blaming official bureaucracy or the lack of funds.

"The number one problem is not money," he says. "We do not need much money or fancy equipment to carry out our kind of natural resources research. It costs only about 1000 pesos (US\$110) a month for the upkeep of Sumilon Island."

"We do not have enough commitment — that is our problem," he says. "Somehow, the tradition among students — certainly in the Philippines — is not to get into sciences, but to study to be business people, or doctors, or lawyers. There are just not enough committed people around."

Awareness is another element that Dr Alcala feels is missing in the battle to preserve the Asian environment: "Insufficient numbers of Asians are aware of the long-term negative effects of the wanton destruction of Asia's forests and reefs. What clouds the issue even more is that many of those who are aware do not really care."

Dr Alcala says that it is even difficult to get across to the public a simple conservation fact: that if everyone who visits Sumilon Island takes a piece of coral as a souvenir there will eventually be no Sumilon reef.

It is easier to explain the efforts of a politically powerful group of local fishermen to prevent Sumilon Island from being declared a sanctuary — they see themselves as being deprived of one of their fishing grounds. They still do not seem to realize that it is they who will be the ultimate beneficiaries of the 700-metre-long protected reef.

Despite his long battle against the anti-conservationists, Dr Alcala does not believe the outlook is entirely bleak. And he points to another island, not too far from Sumilon, that is fueling his optimism.

The villagers on Apo Island have set up their own fish sanctuary. With only a little help from Dr Alcala, they have come to realize that sea life is exhaustible and that, if they want their grandchildren to follow them in their fishing trade, they must help preserve some of that sea life.

To the Apo villagers, conserving means giving up some of their fish catch now so that their descendants can be guaranteed of their share. It requires them to be less selfish, to think of those who come after them. "Conservation means thinking of others," says Dr Alcala. "Perhaps that is what makes it so hard to promote." □

*Lillian Chew is Science Editor of the Straits Times, Singapore.*



**By-product utilization for animal production: proceedings of a workshop on applied research held in Nairobi, Kenya, 26-30 September 1982,** Berhane Kiflewahid, Gordon R. Potts, and Robert M. Drysdale, editors. Published February 1983, 158 pages, IDRC-206e.

This monograph presents the proceedings of a workshop held to review promising research thought to be technically and economically feasible for animal-feeding systems using by-products. Results of by-product research in Egypt, the Sudan, Indonesia, Tanzania, Pakistan, and Kenya are presented that discuss measurement of nutritional quality of by-products, feeding trials, economic considerations, and on-farm testing.

development efforts in multiple cropping in the humid tropics of Asia, a system that intensifies production by growing several crops on the same piece of land in rapid succession. It evaluates contemporary schools of thought on research and extension methodologies, identifies areas of research and development that are expected to maximize payoffs in terms of increased farm productivity, and describes the Philippine experience in accelerating the adoption of multiple-cropping techniques.

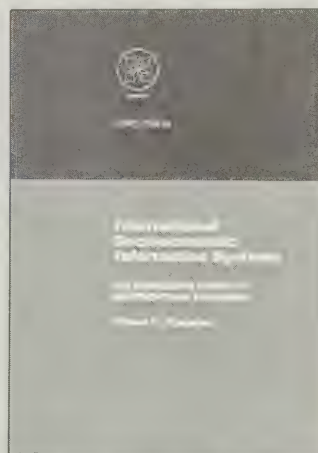
**Le monde de l'alphabétisation : politiques, recherche et action, réalisé par le Conseil international de l'éducation des adultes.** Published March 1983, IDRC-117f. (French edition of IDRC-117e, World of literacy.)

Aimed at active practitioners in education and related fields, this review of literacy research presents an overview of planning, organization, curriculum, and costs of literacy programs, and sets out guidelines for those who make decisions about educational policies. An extensive bibliography is included.

**International socioeconomic information systems: an evaluative study of DEVSIS-type programs,** Wilson O. Aiyēpeku. Published February 1983, 100 pages, IDRC-TS43e.

This report presents an in-depth evaluation of socioeconomic information systems

based on the model of DEVSIS (Development Sciences Information System). It focuses on IDRC involvement with the establishment of such systems, and is intended to serve as a mechanism for the exchange of ideas and opinions by those working in this field.



**Cassava toxicity and thyroid: research and public health issues. Proceedings of a workshop held in Ottawa, Canada, 31 May-2 June 1982, F. Delange and R. Ahluwalia, editors.** Published April 1983, IDRC-207e.

The relationship between the consumption of cassava and thyroid condition in humans was discussed in a workshop that brought together scientists from the medical, agricultural, and public health sectors. This publication presents their review of the results of IDRC-supported research on the role of cassava in the etiology of endemic goitre and cretinism, of research on agricultural aspects of cassava, and of priorities for research and recommendations for public health programs.

**Approvisionnement en eau dans les régions rurales des pays en voie de développement : compte rendu du colloque tenu à Zomba (Malawi) du 5 au 12 août 1980.** Published February 1983, 137 pages, IDRC-167f. (French edition of IDRC-167e, Rural water supply in developing countries.)

This workshop was a forum in which technologists and trainers considered low-cost, renewable energy technologies for water supply. The training aspects of operation and maintenance, community participation, and health education in its delivery were also discussed. All presented papers, discussion summaries, and resolutions and action plans for training are included in the publication.

**Installations sanitaires dans les pays en voie de développement : compte rendu du colloque sur la formation tenu à Lobatsi (Botswana) du 14 au 20 août 1980.** Published March 1983, IDRC-168f. (French edition of IDRC-168e, Sanitation in developing countries.)

Representatives of eight African countries met to plan personnel development for sanitation and encourage upgrading of professional, technical, and village level training programs. This publication contains all presented papers, discussion summaries, and resolutions and action plans arising from the workshop.

## By-Product Utilization for Animal Production

Proceedings of a Workshop on Applied Research Held in Nairobi, Kenya, 26-30 September 1982

**Multiple cropping in the humid tropics of Asia,** A.A. Gomez and K.A. Gomez. Published March 1983, 248 pages, IDRC-176e.

This book summarizes the results of current research and





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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# Reports

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Handwritten text in Arabic script on a wooden tablet, likely a traditional form of education or record-keeping.

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Education  
and change





# LETTERS

## Animal folly

I am very much concerned about your recent article in the January, 1983 issue of *Reports* [11(4)]. Although the cover statement "Livestock: resource or risk?", and the title of your story "Feeding folly?" both end with question marks, the first part of your article certainly leaves the impression that there is no question in your mind as to livestock feeding follies.

I feel that you have used statistical information to present a distorted and sometimes inaccurate picture, and that the generalizations made cannot be applied in a random fashion to the "world."

Oversimplifications detract from any message you might be trying to convey. Let me cite the most obvious: "To produce one kilogram of grainfed beef requires close to 8–10 kg of feed grain." Feedlot cattle usually only gain half or less of their 450 kg slaughter weight being fed high-grain rations (not all grain) at a feed efficiency ratio of 8:1 or less, the rest of their weight having been gained on a roughage-only ration. Your "welter of statistics" are being misused. How much protein from the world's livestock is being produced from plant protein sources (forages, etc.), which would otherwise never be available to the human population?

You say, "cattle are usually fed grain simply to make them fat." Grain fed

to cattle results in increased *growth*, which is both protein and fat.

E. Donefer  
Professor, Department of  
Animal Science  
McGill University  
Ste. Anne de Bellevue,  
Canada

## Further folly

Bob Stanley ("Feeding folly?", *Reports* 11(4) January 1983) presents some of the common arguments against animal production without telling the whole story. For example, he says animals and humans compete for grain. Not true by and large in the developing world. There livestock are much on their own — foragers that eat what humans can't or won't. Some 75 percent of the farms in those countries are mixed crop/livestock operations. Farmers know the two go together. They want the economic and biological benefits of both. So they farm in a "system" — one that under present conditions allows them to survive.

As for getting Americans and other grain-producing nations to eat less meat and save that much grain — that isn't the answer, either. We have grain gluts now — and they aren't solving the world hunger problem. Our feeding grain to livestock is an economic decision — to save the grain and its value, and to prevent other costs such as high storage costs. Stanley does talk about solutions that will help — improving the genetic stock of local animals, improving what they eat,

conquering the diseases and pests that debilitate and kill them, and so on.

We need the animals to process forage and those grains and other materials that humans can't use. We need livestock making the contribution they can, along with plants, to the alleviation of hunger around the world. It is not either-or, but what each can contribute best. We have to understand that system — and then to see how to increase the contribution of livestock to the betterment of that system.

Mason E. Miller  
Communications Officer  
Winrock International  
Livestock Research and  
Training Center  
Morillon, U.S.A.

## Editorial response

*There is no disagreement on the specific points raised by our correspondents. Livestock can be raised on forages grown on lands unusable for food crops; they can eat by-products and agricultural wastes. Descriptions of IDRC-supported work in developing countries to exploit these capabilities formed the main part of our article.*

*A brief section of the article pointed out that livestock are not always raised in this conservative and efficient manner, but are fed grain in intensive production systems. We presented some of the criticisms of this practice — that it is wasteful of resources and inappropriate to developing country production systems — in order that our readers better appreciate the balanced approach taken by animal scientists in developing countries.*

*However, our correspondents have misread these criticisms as a sweeping indictment of livestock production. This is a confusion of our cautious presentation of both sides of an issue. We thank our correspondents for the opportunity to use*

*their letters to stress again the contribution of livestock to the food system, and that research is the means to increasing that contribution.*

*The editors*

## Animal disease

As the editor for a livestock research organization, I was particularly interested in your article on livestock production, "Feeding folly?", (*Reports* 11(4) January 1983). There was a brief mention of the International Laboratory for Research on Animal Diseases (ILRAD) research work in this article and of our two target diseases — trypanosomiasis and East Coast fever, a form of theileriosis. We are always pleased to see coverage of our work. However, your description requires clarification.

Zebu cattle [mentioned as having a mechanism that gives apparent immunity to some parasitic diseases] are highly susceptible to trypanosomiasis, though perhaps slightly less so than European taurine breeds. The African cattle that are well-known for their resistance to trypanosomiasis are the N'dama and the West African shorthorn. More important was your statement that we believe it is only a matter of time before practical vaccines will be available. As careful scientists, I don't think anyone on our staff would support this statement. In the case of trypanosomiasis at least, much of what we have learned about the parasite has shown us how difficult it will be to ever vaccinate against this disease. Or a major discovery could be made next month.

Sidney B. Westley  
Scientific Editor, ILRAD  
Nairobi, Kenya

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports, P.O. Box 8500, Ottawa, Canada K1G 3H9.*



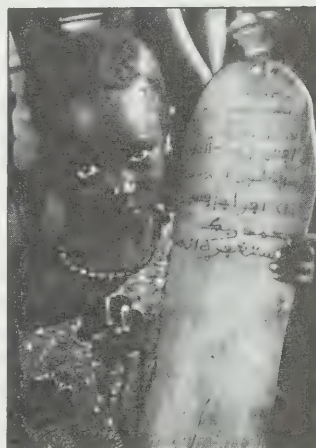
# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explorer* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. Editor-in-chief Rowan Shirkie. Associate Editors French edition: Jacques Dupont; Spanish edition Stella de Feterbaum. Staff photographer: Neill McKee

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**Front cover:** A young girl in Diourbel, Senegal, shows her slate with its passage from the Islamic holy book, the Quran. Education in developing countries must take many forms to meet many needs. See articles beginning page 4.

Photo: Daniel A. Wagner

**Back cover:** A cigarette vendor in Manila, the Philippines. A truly modern epidemic, smoking is spreading in the Third World. See story page 14.



# KNOWLEDGE OF LEARNING

SHELDON SHAEFFER

**T**oo much, unfortunately, has come to be expected of education — by parents and pupils, policymakers and politicians, international organizations and donor agencies. It is meant to produce good citizens and industrious workers and provide a chance to move individuals and families up and out of poverty for good. Education often succeeds in these tasks, but when it fails, disillusionment sets in with a vengeance, and blame is distributed throughout the system. Good research can assess the causes of failure more fairly and often indicate how to increase the success of education in achieving reasonable and worthwhile goals.

But the structures and processes of education cannot be seen in isolation from the social, cultural, and economic environment that surrounds them. Whether education is seen as reacting to society or helping to shape it, research must take into account how it reflects, reproduces, affects, and is influenced by the family, the community, the culture, the nation, and, increasingly, the transnational structure of power and interdependency.

Such research, however, must be done by those who know a country and culture best and have a stake in its future. This leads directly to the Centre's responsibility to fund research in the developing world by researchers from the developing world and to the IDRC's interest in research training — formal and informal, long-term and short-term, individually and in groups, for young and experienced researchers alike. Building greater competence in research, we believe, can best be done through a broadening of experience, a sharing of expertise, and the practice of doing-it, and not only through the inevitably unequal relationship between an "expert" and a student.

Five years ago, most of the annual budget of the Centre's education program was spent in developing a series of pilot projects in the development and use of self-instructional learning materials. These projects in the Philippines, Indonesia, Malaysia, and Jamaica have been provided some CAD\$2 million since their inception. The basic pattern of self-instructional materials has been adapted in each of its various settings, and the projects themselves have, in varying degrees, become a standard part of the established education system.

In the last four years, the education program has funded many more and varied projects, many quite small in size, throughout the developing world. An average of 25 projects per year, ranging in size from CAD\$9000 to \$420 000, have been supported. These projects have operated in over 35 countries, in university faculties and research centres, in government planning bodies, in regional and international education development centres, and in private research institutes.

A great variety of problems have been examined in these projects — at all levels of the formal education system (from preschool to universities) and in nonformal education as well. Although the encouragement of some general themes of work and methods of research has come from the Centre, the problems examined and the individual projects supported have derived from the demands of developing world researchers themselves. These have included issues of educational finance, teacher training methods, education and employment,

and studies of school efficiency and quality. Recently, special emphasis has been placed on early childhood education; research into various aspects of communications as it relates to education, participation, and democracy; qualitative research in primary education and teacher training; research related to particular needs of women; adult and nonformal education; and the relationship between education and work.

So where has all this activity led? What has been learned, and what has been changed? In educational research, as in research in the social sciences in general, accomplishments are not necessarily easy to identify. Although a new textbook may be as concrete as a new strain of rice or a new handpump, the research results which determine the need for the textbook, which analyze whether its contents match the needs of pupils, which shape its structure and sequence of material to those of the pupils' learning style, which suggest how teachers can best use it, or which evaluate its effectiveness, are often much less conclusive. Even less evident, for example, is the impact of research that analyzes how schools might reflect social authoritarianism and reproduce economic inequality. Yet the impact is there, eventually, as results are published and evidence accumulates that show what education does, why it succeeds or fails, and how it can be improved both in its quality and in its ultimate effects on human lives.

Thus, research supported by the Centre has shown that individualized, self-instructional learning systems are, in some contexts, useful in making learning more efficient and less expensive. Intensive studies of primary schools in several countries have clarified the critical role that teachers sometimes play in unconsciously encouraging pupils to drop out of school, and experiments with teacher-training workshops have shown how teachers' attitudes toward their work can be changed and then can lead to quite different classroom behaviour. Other work has explored the important function of one-room schools in Egypt, the threshold of literacy retention in the Philippines, and the complex process of curriculum diffusion in Sierra Leone. Many more studies in many countries are currently examining problems of similar importance and complexity.

Of final importance is the knowledge that the education process and the conditions that shape it are everywhere somewhat different. Superficially, its problems and its apparent solutions seem universal. Yet every culture, every country is unique: Lessons learned in one may well clarify the problems in another, but they will never completely solve them. The education program of IDRC therefore strongly supports diversity across and within nations — diversity in the choice of issues requiring study, diversity in the research methods chosen, and diversity in the solutions suggested and attempted. Thus, we remain committed to helping researchers in the developing world explore old problems in new ways, experiment with possible solutions and, in so doing, accumulate knowledge that will be of use in improving education throughout the world. □

*Sheldon Shaeffer is associate director, education, in IDRC's Social Sciences Division.*



# NEW DAYS



# FOR OLD WAYS

DANIEL A. WAGNER

*Islamic education  
in a  
changing world*



In 1981, Prof. Daniel A. Wagner of the University of Pennsylvania (U.S.A.) and Prof. Abdelhamid Lotfi of Mohamed V University (Morocco) undertook a comparative study of traditional Islamic education in five countries of Africa, Asia, and the Middle East. Funded by the Ford Foundation, the U.S. Social Science Research Council, and IDRC, the study aimed to provide descriptive and analytical perspectives on Quranic schools. The following article is primarily extracted from two papers\* prepared by Dr Wagner as a result of the study.

**D**iourbel, Senegal. Shortly after dawn, Serigne Abdoulaye, the master teacher, arrives at the *jangu* — the traditional Islamic school. Boys and girls, some as young as three years old, soon begin to take their places in long tin-roofed rooms or in the outside courtyard. On their wooden slates are written 25 to 30 lines of Arabic script. Almost imperceptibly the room begins to hum as the 50 or more children, holding up their slates, start to chant the day's lessons. Class has begun.

These children are learning passages from the Quran, the holy book of the world's Muslims. While the youngest simply mimic the teacher, repeating phrases they do not yet understand, the older students with some knowledge of Arabic concentrate on more difficult passages (or *suras*).

A man in his mid-50s, Serigne Abdoulaye no longer teaches the younger children, but provides individual lessons for the small number of older adolescents who intend to follow in the footsteps of their master. Those who choose to become Quranic school teachers gain on-the-job experience by teaching the scores of younger children who are learning the basics of Arabic and the Quran. In recent years, however, fewer and fewer such apprentices have decided to become Quranic masters.

The scene in this Diourbel *jangu* is being repeated in much of the Third World. Senegal shares one key cultural element with about half the countries and half the population of the developing world — a faith in Islam. One of every five people in the world embraces Islam, and the Islamic tradition has maintained and regenerated itself across generations for over 14 centuries. Within this heritage, the Islamic religious school has been the accepted and most widespread means of social and cultural reproduction. These

schools began with the founding of Islam in the 7th century and spread with Islamic conquests to Spain in the West, to Asia Minor in the East and, later, deep into Africa and to the eastern reaches of Indonesia.

The traditional Quranic school instructs children in elements of Islamic belief and custom, basic literacy in Arabic, and advanced Islamic studies. In Arabic, the word Quran implies "recitation" and recitation of the Quran is a central goal of practicing Muslims. In order to recite properly, Muslim children are taught to memorize as much of the Quran as possible, a memory challenge of considerable magnitude, requiring six to eight years of full-time study for complete mastery.

But in spite of a central focus on the study of Quranic texts, the schools have adapted to the cultural constraints of each society. To the casual observer these traditional schools may appear to have changed little over the centuries but, in reality, they are undergoing significant transformations.

## TRADITION AND CHANGE IN THREE COUNTRIES

Indonesia is the largest and most populous Muslim country in the world. About 95 percent of Indonesia's population of 140 million are Muslims, and almost 20 million children attend the country's Islamic schools. Islamic education is provided both by the government and through private religious schools called *pesantrens*. These schools are descended in part from

*In North Yemen (above, left), girls now participate in Quranic schools. Wooden slates, luh, used for the study of the Quranic suras lie stacked outside the school in Diourbel, Senegal (above, right).*

the earlier traditions of Hindu-Buddhist monastery schools and the head teachers (*kyais*) are often charismatic leaders and community organizers, as well as learned scholars.

The *pesantrens* are economically self-supporting institutions. Students work in the fields and occasionally engage in small commercial activities organized for communal needs. In this way, students support themselves through five to ten years of study and maintain close ties with the Islamic community in which they reside.

Religious subjects, which make up about half the curriculum, are taught using the Arabic script needed for all Quranic study. For Indonesian children, learning to read Arabic is a major and difficult task. Special small classes for young children are often organized for this purpose by volunteers. And while some children make better progress than others, it is clear that all children learn enough to feel part of the dual cultural galaxy of Islamic Indonesia and the Islamic Arabic-speaking world.

Modern teaching methods are making some inroads in Indonesia's Quranic schools, particularly in the cities. In one school next to a Jakarta mosque, for example, a visitor could overhear each of the teenaged students chanting his particular passage loudly, helping to produce a cacophony of sounds.



The teacher had adapted foreign language learning techniques to Quranic study: Each student had headphones, a cassette recorder, and tapes of all the *suras* of the Quran. This year, confided the teacher, one of his students might win the national championship for rapid and accurate Quranic recitation.

Islam arrived in Senegal in the 11th century with the slow but continuous arrival of traders and occasional military incursions from North Africa. The process of Islamization took many centuries, but was undoubtedly spurred on by the arrival of European slave traders in the 16th century. Lasting more than 200 years, the slave trade disrupted the social and economic structure of the country. The main consequences were the rise of Islam as an indigenous anticolonial force and the ascendancy of several large Islamic brotherhoods, which had each developed around a holy religious figure and his descendants.

In the 19th century, the brotherhoods made a series of accommodations

hoods, represented by their own *serignes* in villages, used the schools as a way of gaining access to converts, land, and economic and social power.

The alliance between the brotherhoods, the colonial government, and agriculture has diminished since Senegal's independence, due to the death of various religious leaders, crop diversification, and increased urban migration. The traditional Quranic schools have also felt the changes. The Senegalese are finding that Islamic schooling must adapt or lose its students to the French-language public school system. *Serigne* Abdoulaye's school, for example, has almost no funds as fewer children accept the traditional mode of teaching. New schools and teachers have begun to replace the old.

At one such modernized school (referred to as an "Islamic institute"), in the island city of Saint Louis, rote learning and recitation are still considered reasonable ways for young children to begin Quranic study. After two or three years of memorizing, however, children

values for the future.

After Saudi Arabia, North Yemen is the country most closely associated with the founding of Islam. It has also remained closer to its traditions than any other Muslim country as, until the 1972 revolution, Yemen had been effectively cut off from the Western world for almost a millenium. Before the revolution, the only school system in the country was the traditional Quranic school. Boys would attend from age four to 10 or 12, or until they were needed for agricultural chores. Rote learning, recitation, and the rudiments of literacy were the rule. Only a few exceptional adolescents went on for further study to become Quranic scholars and teachers at the *med-rasahs* (institutes for more advanced studies) in larger towns.

Because of Yemen's low literacy rates, the religious scholars were the controllers and arbiters of most local legal issues. Since the revolution, however, the government has made a concerted effort to increase public school enrollment. This has had two related effects on the separate Islamic school system. First, fewer adolescents have gone on to become Quranic school teachers, because attending modern public high schools offers them a brighter future. Second, with fewer Quranic teachers, and with an increasing school-aged population, the Islamic school authorities have been filling teaching positions with Egyptian school teachers trained in modern secular schools.

Most of the traditional schools now have younger, better trained teachers. Many have begun to use secular primers to learn Arabic and are expanding enrollment in the primary school years. Thus, the traditional school system has begun adapting to some of the pressures of modernization, and is providing a culturally and religiously valued alternative for Muslim families who do not wish to break with their religious traditions.

Quranic schools are thus continuing to play important educational, social and economic roles in Islamic societies in today's world. The part Quranic schools will play in the current Islamic awakening is uncertain, but the fact remains that millions of children attend these schools for all or part of their formal education. The Islamic school is one of the most culturally embedded and least understood institutions that touches the lives of the rural poor of the Third World. Its role in the development process is only just beginning to be known. □

\*Wagner, D.A. "Indigenous education and literacy in the Third World", in D.A. Wagner (ed.) Child Development and International Development. San Francisco: Jossey-Bass (in press); and "Islamic education: Traditional pedagogy and contemporary change", in T. Husen & T.N. Postlethwaite (eds.) International Encyclopedia of Education: Research and Studies. New York: Pergamon Press, 1983.

## THE FUTURE OF TRADITIONS

For many Third World governments, budgets for education are at the top of the list in terms of cost. It should not be surprising, therefore, that they are beginning to reassess the utility and productivity of educational programs.

The achievement of literacy is perhaps the most agreed upon goal of all contemporary educational systems. Interestingly, for a great number of children in the Third World, literacy skills are acquired only through indigenous schools, which have generally been ignored by development planners.

Contemporary Islamic schools are an important example of indigenous education. Like other forms of indigenous schooling, these schools continue to attract large numbers of children. Changes in recent years

have also brought them into direct competition with modern secular school systems, forcing adaptations in both systems.

Many researchers agree that national literacy programs in a number of countries have achieved only limited success in recent decades and that a closer relationship between these programs and culturally indigenous forms of schooling could be beneficial. More information is needed about these schools, however, to avoid wasting financial resources while taking advantage of cultural resources. Their involvement in education policies and programs might enable development planners and policymakers to increase literacy in areas where indigenous schooling touches the lives of so many children.

with the French colonial administration to produce the important groundnut crop for export. The crop necessitated a large, quickly mobilized, and relatively unskilled labour force for planting and harvesting. Or, the brotherhoods were capable of providing the social organization and mobilization of such a force. Thus they were given support by the French and profited greatly from the groundnut trade.

The Quranic schools in Senegal became more or less the instruments of this new agricultural effort. The schools gathered young, able-bodied boys together for study, providing an easily mobilized and cheap source of labour. Students were paid very little because working for the brotherhood was considered a duty. The brother-

are given comprehensive training in reading and writing Arabic. Community support for the institute is high: Besides modern classrooms, the school has a large meeting hall. That poor people choose to make an economic investment of this kind shows the strength of their conviction that Islam is central to their lives. It is also indicative of the increased sense of community felt by the Senegalese toward Middle Eastern Muslims.

*Serigne* Abdoulaye himself has decided to send his children to the modernized Islamic schools. It is a statement that captures the thinking of many parents and teachers: Within a single generation, many Muslims are re-evaluating their pedagogical and social past in order to reinforce their basic





Classroom in Santiago, Chile: Teaching requires an understanding of poverty.

# TEACHING FAILURE

BEATRICE AVALOS

**“C**arlos is lazy! Yazmin steals!”

From the description given by their teacher of these two children in a 1982 first grade class in South America, it seems certain they will be school failures by the end of the year. They will not have learnt what their teacher set out to teach them. They may only move on to a second grade if the law requires that they be promoted. Sooner or later, Carlos and Yazmin will drop out.

In another school, a teacher says of her “problem children”: “These are older children. One is repeating second grade. He can’t read! He can’t write in spite of being a repeater. The other one repeated first grade and is now repeating second grade. He can’t read or write either. They both have problems at home, that’s why they can’t concentrate on their school work.”

School failure is a problem that primarily affects the children of the poor. In the 1970s, approximately one out of every two children in Latin America was repeating the first grade. And although the repeaters remain several years in school, they will pass only a few grades.

These children have been considered failures because of their background. Poor children are undernourished, and often lack even the barest elements of learning stimulation at home to prepare them for schoolwork. Their parents either work so hard that they have no time to interact with the children, or, because they are unemployed, the parents lack the psychological strength to deal with their children’s difficulties.

Poor children who live in the capital

cities of Latin America are part of the marginal society — they know very little of the cultural opportunities of better-off inhabitants. Their homes may be shacks lacking running water and electricity, such as one finds in *los altos* (the high areas) of La Paz, Bolivia. Or their homes may be in a shantytown area of Santiago, Chile, where they may experience early morning police raids that drive their fathers out of the home to bring them back humiliated and frustrated.

When these children go to school they are thrust into what could be for them an opportunity to be children; to play, to find caring adults. Or, they may be delivered into the hands of teachers who will decide at some point that they can never make it and label them as failures. Carlos and Yazmin were labelled — failures.

During the 1960s and 1970s, an important number of survey studies in the developed and less-developed world revealed a relationship between school achievement and background factors such as socioeconomic level, parent education, and parental attitudes to school. The findings of these studies pointed to the devastating effects of poverty upon human development.

Important as they were, such studies have often been used to neglect the examination of what goes on in the schools themselves that could affect the achievement of the poor. And teachers and school administrators have felt that there is little they can do to help the very deprived child to learn.

Challenges to this viewpoint have been raised on many sides, urging that

we look closer at what happens within the schools that leads to failure. With support from IDRC, a group of Latin-American researchers has undertaken research precisely from this perspective. The teams went into primary schools in poor urban and rural areas of Bolivia, Colombia, Chile, and Venezuela to examine the dynamics within them and their relation to the community outside.

The researchers carried out interviews with teachers, administrators, children, parents and other members of the surrounding community. They spent a long time in their setting trying to become a part of the scene. By careful recording and daily writing-up of notes, the researchers gathered an enormous amount of information, which was organized so as to allow for an interpretation of the events observed. The questions that directed their observations were: What happens to children in school that they fail? What is the teacher’s role in this failure?

The classrooms observed in the four countries included in the study were the first to fourth grades. The children all came from poor backgrounds. As a result of identifying key events and then searching for explanations from within the data, a set of broad categories has emerged that serves to identify processes that may account for *actual* failure of children who are *potential* failures because of their background. These categories can be stated as “downgrading the losers”; “teaching unclearly and with errors”; “encouraging repetitive nominalism”; and “frustrating participation.”

**Downgrading the losers.** Researchers observed children who were judged as being poor learners, lazy, untidy, misbehaved, and who were consistently treated as such no matter what they did to try and improve or change. These children experienced a very limited type of interaction with their teachers. Most of it consisted of being “told off” — reprimanded for their failures in front of the whole class. Often these children had to sit in awkward positions, either at the back or at the side of the classroom, far from the teacher’s direct view. The negative perception held by these teachers was also transmitted to the other children, so that the unfortunate offenders were accused by teachers and peers alike.

Yazmin was one of those children. Teacher: “Yazmin, come!” (Yazmin walks to the chalkboard and is asked to write a number. She is left-handed. She writes a ‘2’, and the teacher says that it is wrong.)

Yazmin: “Four?”

Teacher: “All right, four.” (Yazmin writes ‘4’ slowly with her left hand. The teacher puts a plus sign next to the number and Yazmin writes ‘3’.



The teacher had wanted a '1'.  
 Teacher: "That's not a one. What number is that?"  
 Children (in chorus): "Three."  
 Teacher (with annoyed tone): "Go on, then, write '1'." (Yazmin looks at the chalkboard and does not write anything. Several seconds go by.)  
 Teacher: "Sit down and watch what someone else does."  
 Several children (shouting): "I!" "I!"  
 Teacher: "Gilda, you are so quiet. Come here." (Gilda goes to the chalkboard and the teacher holds her hand as Gilda attempts to write the number '1'. However, she writes it backwards.)  
 Teacher: "No, that number is reversed." (She erases it and then holds the child's hand and helps her write it correctly. She then helps Gilda write the number '5', which is the correct sum of four plus one.)

It was obvious that Gilda and Yazmin received different treatment: one was a caring type of help; the other, rejection. What the teacher thinks of Yazmin was recorded in an interview with her:

"She is an awful girl. She does terrible things. Yesterday there was a circus here in the school. A boy brought a packet of biscuits to eat at the circus. I don't know how Yazmin managed to get into the room and steal the biscuits, but she did. When we asked her about it she admitted she had done it. She doesn't deny things. The other day, in front of everybody, she took a banana from a friend's bag and ate it. The problem is that her mother doesn't believe me when I tell her."

The other children also had something to say about Yazmin:

Children (to the observer): "She is lazy!"

Observer: "Why is she lazy?"

Child: "Because she is untidy. Her books are dirty. Look!" (She opens a book and shows it. Yazmin, who is present, snatches it away.)

### Unclear and erroneous teaching.

Teachers are not always accurate in what they convey to the children, nor clear in the way they present their material. When lack of clarity and erroneous content are given in the context of an authoritarian classroom atmosphere, the weaker children become the main victims.

### Encouraging repetitive nominalism.

A common way of teaching, found almost everywhere, was that of having children repeat words after the teacher, or give a word after another clue word has been given. Where such a methodology was used, rarely was there an effort to see if the children really understood what they were repeating. Overheard in a third-grade math class on the theory of sets:

Teacher: "How many units in one hundred?"

Pupil: "One."

Teacher: "How many units, units?"

Pupil: "Ten."

Children (in chorus): "One hundred!"

Teacher: "One hundred what?"

Children (in chorus): "Units."

Teacher: "Oh, one hundred units; so how many units does a hundred have?"

Pupil: "Ten."

Pupil: "One hundred."

Teacher: "One hundred what?"

Children (in chorus): "Units."

Other children (in chorus):

"Hundredths."

Teacher: "So we have one hundred units; if we add another hundred, how many do we have?"

Children (in chorus): "Two hundred."

**Frustrating participation.** It is almost a universal pedagogical notion that children need to be participants in the learning process, not passive recipients of information. However, many of the classrooms observed presented a limited participation, linked to the type of repetitive questioning described above, or to gain information about events occurring in the classroom and about other children. Seldom did the children's questions appear to be considered very seriously.



*Aymara Indian children and their mothers in La Paz, Bolivia: a special struggle against failure. Photo: Beatrice Avalos*

Carol is a fourth grader whom the teacher considers to be lazy. She is constantly being reprimanded for something. Carol rarely goes up to the teacher's desk to ask about what she is doing. But when she does, the following dialogue is typical of the response. Carol (showing her book): "Miss, is this right? The little animals here and the organs there?"

Teacher: "You again! And then you cry... 'Miss, I don't have... Miss, here, Miss there.' You still have not finished your Spanish work!"

But some children do get heard when they cry, especially if they are reporting on the behaviour of others who are less favoured.

There are many other factors that obviously contribute to a child's failure, including the perception that the various actors in the process have of failure.

Failure for the first-grade teachers is the fact that children did not acquire reading and writing skills. But in the everyday context of their classroom,

they are more concerned with the formal aspects of the child's activity rather than in helping him/her to learn. Clean, neat books and polite gestures are important elements for judging the children.

Failure for the parents is having their child repeat a class or having eventually to drop out of school. Parents attribute failure not to the school, but to their own poor situation. It was an exception find a Bolivian mother who said: "The teacher is not good. She calls my son an ass. I think they have caused a trauma in him. Boris came up to me one day, crying: 'I am an ass, mama, I don't want to go back to school!'"

Most parents prefer to say that their child is doing poorly because they have no time or means to help in studies, or that the child is probably mentally deficient, or "lacks a vitamin."

The children themselves rarely perceive where their problems lie. They all acknowledge that the school is an important place for them and that what is wrong is probably wrong with themselves. The successful children, as observed in the classrooms, were those who — apart from native ability, better home conditions — had learnt "the rules of the game." They knew when to put on a questioning face when the teacher required it, or to avoid asking questions, especially those that might embarrass the teacher. Children knew that to be successful they must convey that they are interested in what is being said or done, and that this means asking procedural questions: "What are we going to write?" "This way, Senora Elvira?" (showing a notebook). "How many lines should we leave?" Successful children are also always there to provide a service for the teacher, to wipe the chalkboard or pass a book.

And how do the teachers themselves understand the problem of failure? Too often they are quite unaware of how their teaching reinforces the failings in a child. Given that they teach very deprived children, teachers consider background factors to be a major cause of poor learning. In some cases, however, they are not well aware of the specific home problems children have and treat them as if these did not exist. An administrator in the Bolivian education system told a researcher how a teacher constantly punished a girl who did not do her homework, not knowing the child had to work to support a disabled father.

Strong as this study found the element of teacher responsibility for failure, it was somewhat mitigated by several factors that do affect the teachers' situation. These vary from country to country, but to some extent can be generalized. Teachers act as they have seen others do, and as they were taught to do during their training period. Evidence for some countries indicates that methods used in the Normal Schools (where primary teachers are trained) are similar to those we have



called "repetitive nominalism". Teachers are taught with superficial participation, and little focus on meaningful content or on an inquiry-oriented attitude.

Teachers are poorly paid. In fact, they belong to the lowest groups within the social échelons of their countries. And teachers work in conditions that might seem impossible to a colleague in North America or Europe. In La Paz, Bolivia, on a beautiful hilltop but in freezing temperatures, observers saw children having a class outside because there was no room in the school. Children also stand in their classrooms throughout their classes because of overcrowding and lack of desks.

Administrative rules and regulations

also convert an important part of Colombian teachers' time into a forms filling routine. Or political changes disrupt the course of teacher's lives, such as occurred in Chile with the transfer of schools to the control of municipalities. Teachers lost their tenured position and have found themselves at the mercy of new and often arbitrary authorities not used to having schools within their offices.

Problems cannot be dealt with by only looking at a few of their elements, but it seems that a beginning needs to be made somewhere to help reduce the number of children condemned to failure. Teachers are willing to change and they know that theirs is an important social function, but they rarely

know *how* what they do affects their children.

More research that tells us more about life in the schools, and how it relates to their communities, will help us to understand where and how changes can be made. In-service teacher training that builds on this research and helps teachers see themselves in their teaching should also help them to develop teaching attitudes and practices that provide a greater chance for the children of the poor. □

*Beatrice Avalos, a Chilean education researcher, was coordinator of the IDRC teacher effectiveness project network in Latin America.*

## STUDYING TEACHERS

The students were passing around a book full of pictures of lions, elephants and hippopotamuses. Their whispering and muffled laughter inevitably reached the ears of the teacher, who abruptly stopped what he was doing.

But rather than punish those who had disturbed him, this teacher asked them to share the book with everyone in the class. Then he led a brief discussion on African wildlife before turning to the lesson.

This incident, in Sierra Leone in West Africa, eventually led to the establishment of a small library in the classroom. The teacher had deliberately chosen to emphasize the book and its contents. For once, his students actually had shown an interest in the printed page!

Magnus Cole, a professor of educational development at Njala University College in Sierra Leone, began collecting anecdotal information like this in January 1980. With support from IDRC, he planned to use it to investigate the effectiveness of elementary and secondary school teachers in his country. His method involved interviewing the "students": He asked adults who had graduated to the labour force what actions by their teachers had most influenced them, positively or negatively, in the learning process.

Among other things, the objective was to find out what the *good teachers* did. By comparing "good teaching", as defined by students, with standard professional evaluation techniques, Mr Cole hoped to obtain information useful in improving effectiveness.

Close to 1000 anecdotes were gathered. When the time came to compile and classify them, he found that memories related to discipline were, tragically, the most numerous. Worse still, negative incidents, in which discipline was used in a purely punitive and unfair manner, were twice as numerous as those in which discipline was exercised fairly and with a beneficial effect on the student. Researchers identified 16 different categories of negative incidents that discouraged students from learning. Only 11 positive categories of incidents that encouraged the students to learn were identified.

The interviews were full of cases of undeserved

punishment, arbitrary suspension and excessive detention. Some remembered teachers who cancelled the lunch break, others recall being injured by teachers.

Fortunately, the situation is changing. In the past, parents unquestioningly supported the disciplinary measures imposed by teachers.

Today, because the parents themselves have somewhat higher levels of education, they defend their children against abusive punishment by teachers. Especially in the towns and villages, where classes are smaller and people know each other, teachers less frequently resort to physical punishment.

The results of this West African investigation confirm the arguments of specialists around the world, who say that reinforcing positive behaviour is better than using negative disciplinary measures in teaching.

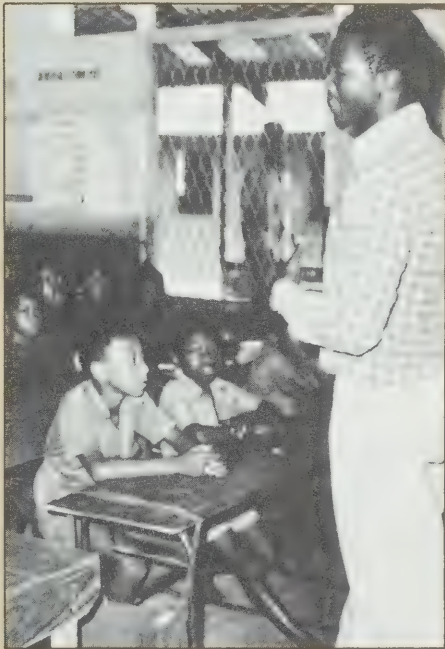
Certainly, less importance should be placed on corporal punishment or discipline, the study suggests. When children misbehave the teacher should first begin by finding out the reason for the behavior, rather than immediately try to change it by force.

At a recent national seminar organized by Sierra Leone's Ministry of Education in Freetown, authorities agreed with Mr Cole that from now

on, young teachers in training should be made aware of the importance of using positive methods of changing learning behavior. Further, the investigation showed that a teacher's academic knowledge of a subject was not the determining factor in whether or not students wanted to learn. A fair-minded teacher who was prepared to help the weaker students and who regularly organized extra-curricular activities was a better motivator of learning.

"Teachers do not have to be super qualified," Magnus Cole concludes. He recommends intensive on-the-job training programs, with regular sessions during which teachers could discuss their problems and help each other. And what is good for students is also good for teachers: A little positive reinforcement goes a long way.

*Jean-Marc Fleury,  
Regional liaison officer, Communications Division,  
Dakar, Senegal.*



*In Sierra Leone, the best teachers were those who could motivate children.*



# REVOLT AGAINST IGNORANCE

JOHN McFADDEN

**B**y the end of June, 1979, the Sandinistas\* knew that they had won the bitter struggle with the then oldest dictatorship in Latin America. After 43 years of family rule by the Somozas, the people of Nicaragua were about to get a change in government. Even though the battle for Managua was still raging, ministers were named and position papers drawn up to provide the outline of how the soon-to-be government would organize itself. One of these position papers came from the future Minister of Education, Carlos Tunnermann. It was a proposal for a national literacy campaign within the framework of the reconstruction process.

The need was great. Nicaragua had a very high illiteracy rate: 50 percent of the population over 10 years of age did not know how to read. As a reform government, the Sandinistas were concerned that they had to move fast and hard on the promises they had made to the people of Nicaragua about a revolutionary win meaning a better life for all, especially the poor. Along with political liberties and human rights, that meant increased services in health, housing, transportation, food and, of course, education.

Managua fell July 19, 1979, within days of the writing of the literacy proposal. Within a week, Father Fernando Cardenal, S.J. had been asked to head up the effort to teach the country to read and write. He accepted and again, within days, had recruited the small band of Nicaraguans who became the nucleus of the adult education leadership.

The basic structure of the literacy program was decided upon early in the autumn. There were departments of curriculum development, teacher training, research, administration, fund raising, design and graphics, statistics and census, press relations and "organization", which was the division in charge of teachers and implementation.

The official name of the literacy program was also decided upon early: "National Literacy Crusade in Honour of the Heroes and Martyrs of Nicaragua's Liberation." Indeed, many of the tactics and much of the strategy of the Crusade were taken from the 20-year revolutionary struggle against the Somoza dictatorship. Perhaps most

important was the strategy of relying on the people themselves to win the "battle against ignorance," as it was called.

The local structure of the Crusade was set up so that representatives of local organizations were part of the decision-making process. Typically, that meant there would be a representative from the neighborhood, a women's organization, a labour union, the local business community, a farmworker, and the priest or a layperson representative from the local parish.

The literacy Crusade was given the number one priority of the new administration, and the whole population turned to the accomplishment of the educational task. Political theorists call it "popular participation", and the literacy Crusade is one of the most interesting examples of it in recent history. The reason Nicaragua did so much better than any of the other countries in Latin America who started literacy campaigns after 1979 (and many countries did, somewhat to counteract the image that literacy goes with revolution) is that the new government had the credibility to mobilize the country to do the job.

It became obvious that there was nothing very mysterious about the process of teaching the country to read. The main ingredient was the hard work of hundreds of thousands of people who volunteered their time, and an administration that subordinated all other priorities to basic education.

The non-paid community advisory group was equal in authority to the local staff of the Ministry of Education. Through this structure, the local peo-

ple had input into the planning and decision-making and were able to participate by carrying out specific tasks.

Back in Managua, in late 1979, the textbooks and teachers' guides were being prepared at a furious rate. The deadline was close. The only month in which the Crusade could start was March. Harvest season comes to a close then, but the rainy season has not yet started. Teaching had to be completed during the rainy season, because the rural people all work long and exhausting days during the harvest. Yet the Crusade also had to start before the rains got serious, because

Nicaragua is a poor country with few roads in the rural areas. Teachers typically walked five days to get to the place in which they were to teach. Doing that in the rain would not have been just unpleasant, but likely impossible because of rising rivers and paths that become impassable for the whole rainy season. The teachers had to get in before the rain started and stay until it ended.

Who were these teachers, willing to go to places where there were no doctors, nurses, electricity, running water or any other amenity except the friendship and support of the peasants themselves? They were high school and university students who had obtained permission from their parents to go on this dangerous and selfless mission. It was no small thing to decide to do. There was physical danger from the harsh conditions and from bands of counterrevolutionaries (defeated members of Somoza's army) that still wandered the countryside. The danger was not just hypothetical. Of the 60 000 *brigadistas* who taught in the countryside, 56 did not return. Some died from accidents, but seven were actually murdered by counterrevolutionaries in an effort to scare them away and stop the teaching effort.

The teachers were called *brigadistas* in keeping with the metaphor of a "war against ignorance": *Brigadista* literally means a member of a military brigade. The organization was set up that way partly because it was efficient and partly because it gave Nicaraguan young people a chance to be active participants in another "war of liberation."



*The literacy army on the move: an education in education.*



In Nicaragua, the literacy Crusade not only taught people to read and write, but gave the *brigadistas* quite an education too. Part of it came from seeing and living in the poverty of the countryside. Overcoming that poverty was one of the main reasons the Sandinistas started the revolution in the first place, so it was important for the "future of the country" — the educated young people — to really understand it. The other part of the education of the *brigadistas* came from "ownership." They all fought and suffered in a war of liberation against ignorance; some of them even gave their lives. They "owned" the reform movement of the Sandinistas, because they suffered and worked as participants in it by teaching the country to read and write.

The young people who were headed for the countryside to teach literacy were carefully trained. They were organized into the EPA (*Ejercito Popular de Alfabetización*), the Popular Literacy Army. During January, February and early March of 1980 they did calisthenics, studied revolutionary politics, learned to march, and developed the "spirit" they would need to sustain them once they hit the harsh reality of the countryside.

For many, it was a return to the schools where they had been receiving their own education. These included private schools as well as public. The participation of youth in the literacy effort cut across class lines and religious lines (Protestant high schools and even seminaries, as well as Catholic and public schools cooperated with the literacy effort). It also cut across the lines of inherited sexism, as young women participated equally with the young men in the arduous and dangerous work in the countryside.

The basic unit was called a squadron, ideally made up of 30 student-teachers and three "conventional" teachers. The squadrons were all male or all female. This division was very important in developing female leadership. The female squadrons automatically drew out female leadership at the squadron level. Then at the regional level (for example, every three squadrons had a student-teacher supervisor in charge of all three units) a young woman could as easily be in charge as a man. For example, one frequently saw a 15-year-old woman taking charge of the regional supervision of 60 young men and 30 women, because that happened to be the ratio

of men and women literacy teachers in that area. The result was a quiet gain in confidence and stature on the part of the women (the previously unthinkable — young women giving orders to young men — was now becoming routine).

And what about the three "conventional" teachers who formed part of every teaching brigade? The government maintained the teachers on salary throughout the Crusade semester, during which all regular schools (except the graduate schools in medicine and agronomy) were closed. About half the teachers decided to remain home and work on curriculum development. But the other half swallowed a great deal of fear and trepidation to accompany the student-teachers and provide technical supervision in literacy teaching skills, and also the comfort of presence of someone older and more experienced for the five months of literacy teaching. The teachers who went shared all the hardships of the student-teachers, lived with the same families, ate the same food, dug the same latrines, scratched the same

mosquito bites and suffered the same frequent bouts of malaria.

In theory, political supervision came from the student leadership. Technical supervision — how to teach reading and writing — came from the school teachers. That produced a few ruffled feathers and some conflict, but usually the teacher and student-teacher leadership "rose to the occasion" by cooperating in both kinds of leadership.

The concept of "political supervision" might sound obscure or ominous. But in Nicaragua, it did not mean something like "checking on ideology", but rather reminding the students of why they were where they were, and what their sacrifices meant in terms of the common good and good for the peasants.

The training of the *brigadistas* for this kind of work was accompanied by the technical training of the teachers in literacy methodology. The methodology was eclectic, drawing from the work of Paulo Freire and others in the Latin American tradition of committed adult education. The most important single influence was the literacy work done by educators committed to social change in pre-revolutionary Nicaragua itself. The teachers were given this methodology training in intense week-long workshops. They in turn taught the high school and college students.

The frantic labour to have primers written and ready by March was successful: The deadline was met and the student-teachers, with their teachers, departed for the countryside on March 23, 1980.

Five months and much more labour later, the *brigadistas* started to return to the cities, in mid-August. A celebration in the main plaza in Managua ended the Crusade. The largest gathering in Nicaraguan history — 500 000 people, a quarter of the population of the entire country — heard the announcement that the illiteracy rate had been reduced from 50 percent to 12.96 percent and that Nicaragua was declared "victorious in its battle against illiteracy."

As the sun set and the speeches ended, the best bands of the country began to play. People celebrated what they had done to make Nicaragua a better place to live. The music and dancing lasted until dawn, the symbol of the new Nicaragua, and the title chosen for the literacy primer — *The daybreak of the people (Amamecer del Pueblo)*.

If daybreak was the literacy Crusade, the new morning of Nicaragua is a successful adult education program, which continues to the present with the same people who learned to read and write in 1980. □

John McFadden, is associate professor in the School of Education at California State University, Sacramento (U.S.A.). He coordinated an IDRC project to write a definitive history of the Nicaraguan literacy Crusade, IDRC-189s *Vencimos: la Cruzada Nacional de Alfabetización de Nicaragua*, published recently.

## READING THE SIGNS

Literacy campaigns have become important tools of education and development. Most attempt to link learning reading and writing skills with building an awareness in people of their own potential to change and improve their lives.

Quickly writing new texts and teaching materials, running crash training programs for literacy workers, and pulling together an organizational network that extends into almost every home in a developing country commands almost the total attention of the country for the duration of a literacy campaign.

There is often little time or few resources remaining for an evaluation of results or examination of the process of mounting a literacy campaign. Yet the knowledge to be gained from such investigations could be extremely valuable for other countries, or in providing ways of making ongoing campaigns more effective.

IDRC is supporting research on literacy campaigns in three countries: In Ecuador, an evaluation of the processes and outcomes at the community and individual level; in Ethiopia, a similar examination of methods and effectiveness, together with an assessment of what educational activities should follow the campaign; and in Nicaragua, the preparation of definitive history of the campaign that will preserve a record of experience, development, and results.

\*"Sandinista" is the name chosen by the Nicaraguan revolution to refer to itself. It comes from the last name of Augusto Cesar Sandino, the independence leader of Nicaragua in the 1920's and 1930's. Its use implies that the Nicaraguans wanted their revolution to be viewed as completely homegrown. The name existed for 20 years before the Sandinistas won the revolution. The main leader of the revolution was not Sandino (who was assassinated by Somoza's men in 1935), but Carlos Fonseca Amador (1936-1978), a brilliant student and political leader.





## SATIRE: ON THE ROAD TO CHANGE

JAN W. WALLS

**T**o understand the suasive force which Chinese traditionally have attributed to popular media and to their power to influence social values, we need only note the reason traditionally given for forbidding them to young people: They corrupt the morals. One reason why popular media were believed capable of corrupting morals is that they often depicted social bandits as heroic characters, creating what the modern social psychologist would call positive role models out of people whose behaviour the establishment considered unworthy of emulation. The very idea that good and noble ends could be attained through unorthodox means was anathema to the traditional moralist.

The ruling establishment in China has always recognized the power of the popular media to influence behaviour by producing dramatic examples of good and evil, reward and punishment, success and failure. By guiding characters to success or failure through interaction with other people, the storyteller also makes an indirect comment on the social system within which the characters behave. If the characters can achieve satisfactory ends through established behavioural norms, then the net result is to reinforce the traditional acceptance of those norms. If, on the other hand, the characters are denied satisfaction through the use (or through someone else's misuse) of established behavioural norms, and they have to step outside the normative bounds in order to achieve their just reward, then the effect is perceived as subverting confidence in the social

system. Traditionally, governmental authorities had the right to ban productions considered immoral or subversive, but it was not until very recent times that the government of China actually became involved in the production of popular media.

Popular media in the People's Republic of China are an integral part of the communications network, performing at least three important functions: revealing to the public current developments and changes in official policy as determined by the central authorities in Beijing; publicizing certain models of behaviour for emulation, and satirizing others; and providing good entertainment, sometimes completely free of connection to any immediate social or political goal.

To understand the role models being set up for emulation and satire in China today, one must first remember the developments that led to the sweeping policy changes effected during recent years. Since the late 1950s, but especially during the 10 years from the beginning of the "Great Proletarian Cultural Revolution" (1966) to the fall of the "Gang of Four" (1976), the single most important criterion applied to media content was that of ideological purity. No values were promoted through the popular media that did not reinforce belief in the positive, progressive, revolutionary nature of the toiling masses, and in their ability to achieve the most astounding results inspired solely by revolutionary zeal and faith in the correctness of Marxism-Leninism-Mao Zedong thought.

Viewed through the popular media,

*In Xiangsheng, a popular form of comic routine, a duo (left) uses the classic joker and straight roles to satirize and educate. Fast-paced monologues accompanied by castanets (middle) likewise inform attentive audiences in China on the correct route to modernization.*

nearly every aspect of Chinese life seemed highly politicized: family relations, work, school, even play, were depicted in terms of a political line that seemed to run through everything. Since the right political line received so much emphasis, characters portrayed in the media tended to be black and white: revolutionary heroes were faultless and distinguished as individuals only in their extreme identification with the toiling masses, while counterrevolutionary villains were uniformly "rotten to the core," and deserving of nothing but our utter contempt. "Middle characters" (embodying neither starkly positive nor negative values) were usually avoided or kept in the background for fear of diverting attention away from the primary struggle between good and evil. Positive role models were nearly always of the right background, that is, from worker, peasant or soldier families. It was assumed that those with a background other than poor peasant, lower-middle peasant, or proletariat were, by virtue of their primary loyalties, incapable of selfless devotion to the masses, and therefore unworthy of emulation in any respect.

In fact, anyone who proposed faith in any road to modernization other than the revolutionary mass line was branded a heretic and subjected to varying



degrees of re-education, punishment, and public humiliation. In the popular media, most of these heretics were formerly of the landlord class, or were intellectuals, or people otherwise committed to the disruption of socialist construction by the Chinese masses. Intellectuals were depicted in a particularly unfavourable light because of their individualistic tendencies and their lack of commitment to the mass line.

It is against this background of faith in the power of the revolutionary masses, of "radical left" politics in total command of all public media, and persecution of intellectuals whose first loyalty was not to the party line or to the current campaign, that the most significant recent developments in Chinese popular media must be considered. Among the popular media genres — fast clappertales (stories narrated in verse to the rhythmic accompaniment of bamboo castanets), jokes, allegorical tales, fables, poems, short stories in verse, comic monologues, comic dialogues, picture-stories, etc. — we find vivid, lively, sometimes even subtle and trenchant commentaries on the problems faced by the Chinese on their road to modernization. Each piece is a criticism of irresponsible, counter-productive, or just plain foolish behaviour and the mistaken values that tolerate or encourage such behaviour. Some are very old traditional pieces, rendered into the modern spoken language, that take on new and very specific meanings in light of recent events in China.

In some of the best pieces of popular performed art, we see one consistent message: Practice and common sense are the only reliable bases for problem solving. Slogans, the written word, even past practice which once was found successful under different conditions — none of these can replace actual practice and common sense in dealing with reality today.

"Old Zheng shops for shoes," adapted into the form of a modern *Shu-mao*, or short story in verse, is a classic example of the Chinese practice of "making the past serve the present" (*gu wei jin yong*). The original allegory comes from the classical text *Han Fei Zi*, and has been known to every Chinese with the slightest education for 2000 years. Yet, within a modern sociopolitical context, the old tale takes on new life and new allegorical significance for the masses of Chinese who enjoy its performance in the vernacular language today, and who cannot fail to grasp its moral in terms of their recent experience: "People in the old days were strange, you say? I saw someone just like him only yesterday." What we need today, the storyteller is saying, is more confidence in actual practice and performance, as opposed to doctrinaire prescriptions, as valid criteria for determining the course of action.

The story of Old Zheng shopping for shoes is a fine example of the selective

rendering of classical literature, that is both entertaining and relevant to modern life, into a vernacular idiom that becomes accessible even to semi-literate and illiterate audiences through its performance all over China. Ballads and storyteller texts published in journals are studied, memorized, rehearsed and performed by thousands of ballad and storytelling troupes, professional and spare-time, in theatres, in factories and schools, on radio and television programs, even on ping-pong tables in remote villages without a proper stage.

In this way, hundreds of millions of Chinese are being encouraged to accept the new approach to modernization, the new emphasis upon practice and experience. Through mass media, the most isolated peasant in the remotest parts of the country is kept aware of the latest developments in national construction policy, including most recently the implementation of the system of working under contract.

The question most often asked in the popular media is: How relevant are the revolutionary experiences that worked in the past to the technological challenges of modernizing China today? Clearly, the implied answer is: We must not blindly apply methods that worked years ago to the new challenges and changed circumstances of today.

The messages of such tales are

related to the most important and crucial campaign being carried out through the popular media in China today, the most important goal of the so-called "New Hundred Flowers," that is, the liberation of the mind (*jiefang sixiang*) from the fetters of doctrinaire thinking. For if China is to modernize, it must be through the process of creative problem solving: Problems must be solved by thinking people, and people's thinking may be influenced through the popular media.

Perhaps this brief survey should close by acknowledging a difficulty, a challenge not yet mentioned, but whose solution is important to China's modernization. In view of past experiences with campaigns and movements to liberate the mind, with disastrous consequences for serious participants who dared criticize past mistakes of the government, it is not hard to understand why many intellectuals still hesitate to commit themselves wholeheartedly to the "modernization" effort today, and remain cynical about the prospects of success, or even survival, in another liberalization campaign. □

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## OLD ZHENG SHOPS FOR SHOES

*In the land of Zheng lives Genius Zheng  
But everyone calls him Zheng Dum-dum.  
He's stubborn and his temper's not very sweet,  
He won't even try on a shoe unless he's measured his feet!  
Now, one day he's going to buy some shoes,  
But he takes out the measure before he goes.  
He measures the height of the top of his feet,  
Then the arch, and the width, and the length to his toes,  
And carefully he writes 9.876 inches down on a sheet —  
He always buys his shoes by the size.  
Then he puts his note on the table top  
And steps outside, and locks the lock.  
He walks ten miles on his own two feet  
And comes to town on East Main Street.  
They're selling shoes in the market place  
And old Zheng heads over there, making haste.  
Pairs and pairs of brand new shoes,  
He picks out a pair that he can use.  
Then old Zheng reaches in his pocket only to realize,  
"Oh no! I forgot to bring the size.  
Without a size, I can't buy shoes,  
I'd really feel just like a twit  
If I bought 'em and they didn't fit."  
So he hurries on back out of town,  
Going home for the size that's written down.  
He's all worn out and wet with sweat and gasping, he is really beat,  
He's walked so hard that blisters have popped up under his feet.  
When he left, the sun was at high noon,  
When he returned, you could already see the moon.  
He walks up, and looks around, and the shoe market's already closed down!  
Old Genius Zheng can only stand and stare at the empty market square.  
Someone says: "Old Zheng, your temperament's hard to beat —  
Why didn't you just try the shoes on your own two feet?"  
"But how can you buy if you don't have the size?  
Just having feet isn't good enough," Old Zheng replies.  
People in the old days were strange, you say?  
I saw someone just like him only yesterday.*



RHONDA BIRENBAUM

# UP IN SMOKE

*Cigarettes threaten health  
in developing countries*

**T**hroughout history, the great diseases that claimed millions of lives began their rampages in the east and spread their misery relentlessly westward. The bubonic plague was one such disease, thought to have originated in Egypt and rolled west. Cholera made a similar journey.

But in the modern world, cigarette smoking is changing that trend. A new epidemic of heart and lung diseases, including cancer, is being blown like a foul exhalation in the opposite direction. The industrialized nations, traditionally the last to succumb to the great worldwide plagues are, this time, exporting smoking-related diseases to the developing world. Now, before a





village has clean water, it may have three-quarters of its adult population who smoke dead from cancer or crippled with chronic respiratory problems. This new plague is advancing so rapidly that the World Health Organization (WHO) fears the progress made by the Third World in the fields of nutrition, sanitation, and the control of tropical diseases may be sabotaged by cigarettes.

Smoking is a relatively new phenomenon in the Third World. There may have always been a small number of people hooked on the nicotine habit, but consumption was low. Set against a background of infectious diseases and malnutrition, smoking never emerged as a health risk. That situation, however, no longer exists.

Recently, the signs of the smoking epidemic have begun to appear in the developing world. A growing body of research, conducted in India, Jamaica, Pakistan, Papua New Guinea, and Singapore links smoking to cancer of the lung, oral cavity, and esophagus; to bronchitis, peptic ulcers and heart disease.

The health effects of cigarette smoking have already made their presence felt in the Western world. The health monitor of the U.S.A., the Surgeon General, blames smoking for 30 percent of all cancer deaths there —deaths, the American Cancer Society claims, that could be prevented by the elimination of smoking. Even if the smokers can avoid being killed by cancer, the experts say those hooked on the nicotine habit are still more likely to die from chronic bronchitis or other serious respiratory diseases than are nonsmokers.

With every puff, cigarette smokers treat themselves to a veritable feast of chemical and physiological stress. It's not surprising, says former American Cancer Society president Dr Benjamin F. Byrd Jr., that the health toll is enormous.

Dr Byrd describes smoking this way: "Within seconds after a smoker inhales blood pressure starts rising, heart rate increases, skin temperature drops and even eyesight is adversely affected. When (the smoker) exhales, up to 90 percent of the 'true tobacco taste' stays in the tissues as submicroscopic particles of about 1200 chemicals; among them acids, ketones and phenols, most of which are in chimney smoke or automobile exhaust. Sixty percent of smoke is made up of a dozen noxious gases, including propane, formaldehyde, ammonia and hydrogen cyanide. Perhaps the most dangerous of all is the carbon monoxide which replaces up to 15 percent of the oxygen in the smoker's blood."

The dramatic effects of smoking on

health have convinced a good proportion of smokers in the developed world to kick the habit. In Canada, the number of regular smokers dropped by 4.5 percent between 1979-81, according to health ministry statistics. But people in the Third World, with the help of the aggressive marketing of tobacco companies, have only just discovered this new addiction. For them, health concerns have not yet become a major drawback. As a result, cigarette consumption among individuals in developing nations has increased dramatically.

In 1980, 33 percent more Africans smoked than 10 years earlier. Twenty-four percent more Latin Americans were smoking, as were 23 percent more Asians. And in just one year (1980 to 1981), 3.9 percent more people in the developing world had discovered cigarettes, Dr Ruth Roemer, a professor of health law at the University of California at Los Angeles wrote in a report for WHO.

The developing world's attraction to the thin white tube of tobacco is a complex interaction of advertising, marketing, tax revenues, and the addictive properties of nicotine.

Advertising is one of the mainstays of the tobacco industry. In 1978, the United Nations Conference on Trade and Development (UNCTAD) estimated cigarette manufacturers spent close to \$1.8 billion worldwide on promoting cigarettes. How much of that advertising was aimed at the Third World is unclear. But as the tobacco industry aims to replace its dwindling market in developed countries, it is focusing attention on the "great untapped" cigarette market in the Third World. And advertising is an integral part of this corporate expansion.

The tobacco industry has based its Third World advertising campaign on the association between cigarettes and sex appeal, high social status, modernity and sophistication. The influence of such a social aura is not to be underestimated, says Erik Eckholm, a senior researcher with the Worldwatch Institute. As poor developing countries struggle to match the success of richer ones, their people emulate what they believe to be models of success.

In Ghana, a cigarette advertisement features a farmer sitting on a tractor. The advertising copy reads: "Before I grew tobacco I was very poor and scratching a living on the land. My house had only two rooms. I had no bicycle and no radio and no hope of a better future. Now I have got what I never dreamed would be mine — my own tractor. I am also able to educate my children and look after my wives better."

In another advertisement, a young Nigerian student holding a cigarette is seated before an open book. The advertisement attempts to convince

students that cigarettes help them concentrate and that menthol clears the head. Even the brand name, "Varsity", conjures up images of academe and higher learning, appealing to the aspirations of many Africans.

The tobacco companies have also found the availability of cigarettes influences demand. The most successful cigarette promotions involve efficient distribution systems, which virtually cover the countryside with cigarettes. In Ghana a handful of independent distributors reach 40 000 to 50 000 retailers. In Malaysia, fewer than 100 distributors keep 65 000 retailers supplied. Cigarettes are constantly visible and so tend to advertise themselves.

"They (Third World consumer targets) are sitting ducks for the highly sophisticated marketing approach developed by decades of competition in the West," writes Charles Morrow, former director of information for WHO, now a specialist in social development for the Canadian International Development Agency (CIDA). "They yearn for the sense of status implied by slick advertising. The little paper tube is sold not as a cigarette, but as a symbol of financial success, manliness and sexual attractiveness."

The tobacco industry claims advertising has no effect on an individual's decision to begin smoking. It only affects the choice of brand among smokers, say the manufacturers. Advertising is merely a market redistribution tactic. Yet in Kenya, where British American Tobacco (BAT) is the only cigarette company in the country, it continues to spend heavily on advertising. In spite of its market monopoly, BAT is one of Kenya's largest advertisers.

"I find it difficult to believe that advertising won't start people smoking," says Lynn Kozlowski, a behavioural psychologist with the Addiction Research Foundation of Ontario in Toronto, Canada. The Foundation is a WHO collaborating centre. Kozlowski is currently trying to find out why and how people smoke. He says he thinks it is "likely advertising does have effects on (cigarette) intake."

However, Kozlowski and other scientists have had difficulty verifying any direct links between cigarette advertising and consumption. They have yet to establish a causal relationship, that is, determine whether advertising causes smoking. Too many other factors, such as friends and relatives who smoke, the amount of spending money an individual has on hand, and cigarette availability also come into play when a person decides to light up. In countries such as Italy, Norway, and Singapore, where cigarette advertisements are banned, the number of smokers does not appear to be greatly influenced.

*A smoker in Abidjan, Ivory Coast: a willing victim of a global epidemic.*





(Left) Mile 17, near Ekona, Cameroon. Cigarettes spread unchecked into the remotest corners. (Below) The false sophistication of this young smoker in Teknaf village, Bangladesh, will be imitated by others.



Nonetheless, tobacco companies continue to spend large sums of money on advertising to make sure the notion of smoking stays on people's minds and that it is associated with success, pleasure, relaxation, and freedom. Continued promotion of tobacco conveys the message that smoking is socially acceptable, affirms Dr Ruth Roemer.

Tobacco has not only hooked the smokers, though. It also seems to have hooked the Third World farmer. According to FAO (Food and Agricultural Organization of the United Nations) statistics, the Third World produces close to 2.3 million tonnes of tobacco yearly. In India about three-quarters of a million farmers tend close to half a million hectares of tobacco fields. Malawi and Brazil are significant producers, and their farmers reap the benefits.

The tobacco companies, anxious to increase the supply of tobacco for manufacturing, have developed a finely tuned system for encouraging and assisting farmers to grow the tobacco crops. Mike Muller, in his book *Tobacco and the Third World*, written for the British charity War on Want, describes the system.

Field staff go into a country and teach the farmers how to plant, tend crops, apply fertilizers and harvest. The tobacco company also administers and guarantees loans for tobacco production, which enables farmers to invest in curing barns and other equipment. When the crop is ready, the farmers simply bring it to a company collection point for immediate cash on delivery.

This last point, says Muller, is especially attractive to the farmers — who were often obliged to wait months after bringing in other crops before they received any money. According to Muller, these and other

kinds of production encouragements have helped some manufacturers expand the tobacco crop in over 50 countries.

There are some, particularly in health and international development agencies, who would like to see the large land areas given over to tobacco better used in food production. The use of hundreds of hectares of wood to cure the tobacco after harvest is also deplored.

But persuading tobacco farmers their best interests could lie elsewhere is no easy task. It means setting long-term goals against short-term profits from a crop that carries relatively little risk to grow, offers a high return per unit area, and always finds a buyer at a good price.

Tobacco seems to be good for governments too, who rely on it as a major source of tax revenue. In Sri Lanka, the government revenue from taxes on tobacco products topped US\$80 million in 1980. Needless to say, the Sri Lankan government relies considerably on this money. Likewise, in the Philippines close to 47 percent of the total government revenues come from cigarette and tobacco taxes. According to Muller, this factor figured prominently in that country's refusal to insist that health warnings appear on cigarette packages.

With the government interested in taxes, tobacco companies interested in profits, and farmers interested in quick returns for the crops, it has been difficult to carve a place for a health lobby to curb the smoking epidemic in the developing countries.

What is suspected to be a further assault on Third World smokers is the marketing tactic of tobacco com-

panies selling their highest yield (that is, high tar and high nicotine) cigarettes to developing countries. Allegations raised by development action groups like War on Want assert that the tobacco companies are "dumping" in the Third World the high tar and high nicotine cigarettes made unsaleable by law or consumer preferences in the industrial world.

A scattered series of unrelated testing of cigarettes from the Philippines, Kenya, Malaysia and Sri Lanka appears to support these assertions. Tests of tar and nicotine levels performed on the cigarettes bought in developing countries and in the West yield provocative results.

A leading brand purchased in the U.K. had tar levels of 17 mg/cigarette and nicotine levels of 1 mg. The same brand of cigarette bought in Kenya had 22 mg of tar/cigarette and 1.3 mg nicotine. An analysis of another popular trademark cigarette was similar. If purchased in the U.K. the cigarettes had 18 mg of tar and 0.9 mg of nicotine. In Kenya the same brand showed 31 mg of tar/cigarette and 2.0 mg nicotine. In Malaysia, the tar content was 29 mg/cigarette, the nicotine 2.2 mg. In Sri Lanka the tar and nicotine per cigarette registered at 29 mg and 1.3 mg, respectively.

However, these tests results were published without any accompanying information on the reliability of the tests or the levels of statistical significance. Consequently, the WHO has launched a carefully controlled analysis of cigarette chemical levels to determine, once and for all, whether there is any foundation for the allegations.

Dr Richard Frecker, head of biomedical and biobehavioural



research at the Addiction Research Foundation of Ontario, is currently testing cigarettes purchased on every continent worldwide. The purpose is to develop what he calls "cigarette profiles" for both locally manufactured cigarettes and those manufactured under licence of the same brand in another country. He is trying to find out whether tobacco companies are, in fact, dumping high tar, high nicotine cigarettes in the Third World.

"We are working under the hypothesis that they (the tobacco companies) are either using tobaccos they could no longer sell in western countries for Third World cigarettes, or that they have found some way of adjusting the tar and nicotine to make them (cigarettes) more addictive and more dependence-producing. The idea is to see whether or not tobacco companies are using different kinds of tobacco in the Third World than they are in the same brands in developed countries."

Because the study is not yet complete, Frecker will not be more specific. However, he does hint that "the results are more or less what we would have expected. We haven't had any shocking surprises."

The man in charge of Dr Frecker's project for the WHO is Dr Roberto Masaroni, manager of the WHO program on smoking and health. He is equally cryptic about the results of the cigarette study, deferring comment until the full picture has been painted and the results released. He says the WHO will publish an official report shortly, after

the final analysis is complete.

In the meantime, the global anti-smoking lobby is warming up for a battle they expect will be "fiercer than the baby milk powder controversy." People like Muller are convinced the multinational tobacco conglomerates are purposely addicting Third World smokers to extremely high yield cigarettes.

Spokesman for the tobacco industry, William Toohey at the Tobacco Institute in Washington DC (U.S.A.) says, however, "Whatever cigarettes are sold outside the US are made to meet the market demand in that country. In this country (U.S.A.) there's a demand for all types of lighter products; whether it's cigarettes, beer or soft drinks. In other countries they don't have the same taste. Obviously if you're selling any product you give the market what it wants."

And the Third World market of smokers who have limited amounts of money to spend on the expensive cigarettes may simply want high yield cigarettes. "I can't imagine being able to sell low yield cigarettes to a consumer who's buying in units of five or so (the way cigarettes are most often sold in developing countries)," says psychologist Kozlowski. "Basically, it boils down to people wanting a good smoke for their money. If the tobacco companies didn't sell high yield cigarettes they probably wouldn't be able to sell anything."

If, in fact, that is true, and Third World smokers would not buy low yield cigarettes even if offered, then at least they deserve some

information about the effects smoking has on their health, say the anti-smoking advocates. Smokers in the Third World receive the least amount of information about the hazards of smoking, says Muller, but are put most at risk (for them) with the high yield cigarettes they are sold. "If the ethics of selling cigarettes to the Third World are dubious; there can be no question about the ethics of selling the most dangerous products to the least informed consumer."

Few governments in the developing countries require that cigarette packages or advertising copy carry health warnings. It may be futile to put warnings on the packages anyway — many cigarettes are sold individually by street vendors. Publicity concerning the health effects of cigarettes, which led to a decline in smoking in many industrialized countries, has not yet reached the Third World. The Third World suffers from poverty in many forms; lack of essential information is one of them. Cigarette marketing is considered a problem all over the world, but in developing countries, where risk awareness is low and advertising aggression high, smokers are making decisions about their future health with less than a rich supply of data. When the Third World decided to strive to achieve the success of the industrialized nations, it had no idea that meant adopting their health hazards too. □

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## A HABIT'S PROGRESS

It was Christopher Columbus who first introduced tobacco to Europe. And while other famous explorers such as England's Sir Walter Raleigh and Portugese and Spanish sailors were enthusiastic advocates who helped spread the habit around the world, it was probably European physicians who were the most responsible for tobacco becoming a pandemic addiction.

Eager to improve their low social status — due in large part to their reliance on a primitive and ineffectual pharmacy — physicians saw in tobacco the elusive *herba panacea*, the universal cure. Soon after its introduction they were preparing tobacco poultices, urging patients to suck the juices of wet leaves, or simply to inhale and smoke at will. Tobacco was said to heal open wounds and sores, boils, fevers, catarrh, and venereal diseases. And through the regal example set by French queen Catherine de Médicis, tobacco became a fash-



ionable treatment for migraines.

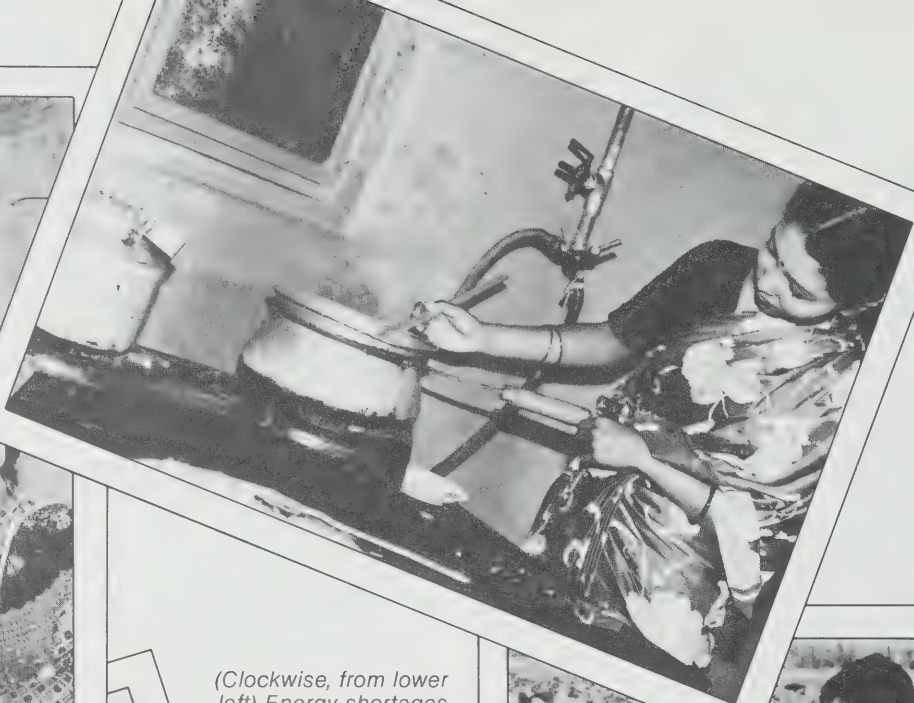
But not everyone rejoiced. Throughout the 17th century there were terrible repressions against smokers. In Russia and Germany, the penalty for smoking tobacco was death. In the Ottoman Empire, Sultan Murad IV also decreed the death penalty. The Sultan was particularly fond of surprising men smoking on the battlefield, whereupon he would punish them by beheading, hanging, quartering, or crushing their hands and feet.

But hanging and torturing offenders did not work. Nor did the massive surcharges — as high as 4000 percent — imposed by England's nonsmoking king, James I. At first it only made tobacco a drug for the very rich, and later resulted in such large-scale contraband that it became a seriously counterproductive measure.

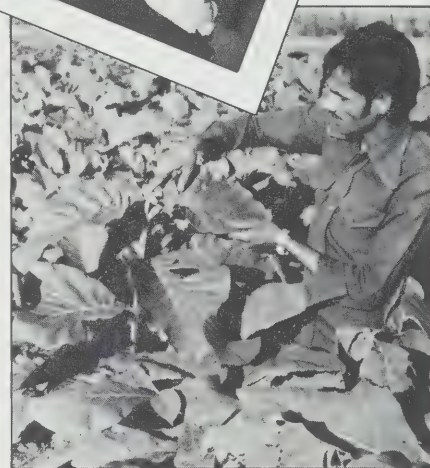
There was also another recreational habit emerging that made the control of tobacco singularly frustrating — coffee drinking. By the 18th century it was considered *de rigueur* for intellectuals, politicians, and artists in large European cities to gather to smoke and drink coffee. Conversations in the cafes where they met were elegant and witty, and tobacco and coffee were intimately associated with being avant-garde, fashionable, and intellectually clever. The association, however false, has proved remarkably durable.

André McNicoll  
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(Clockwise, from lower left) Energy shortages keep these hillside terraces in Nepal unirrigated — and harvests poor. A light powered by a backyard biogas unit illuminates a Nepali home. Another biogas application provides cooking energy. The fuel of the future, young trees in a nursery in southern Nepal take root. Photos: Peter C. Stuart



PETER C. STUART

## POWER IN THE KINGDOM

**T**hirty years ago, this Himalayan kingdom didn't even issue tourist visas. Nepal has changed.

Today giant jets, streaked with the colours of half a dozen national airlines, ferry in thousands of tourists a year.

Young backpackers from North America and Europe come to "trek" in the mountains. Their elders may settle for a glimpse of Mount Everest or Annapurna from the comfort of a lodge armchair. But collectively they spend millions of dollars in travellers' checks, shoot countless rolls of film, and return home — as the travel guidebooks say — "charmed."

For most of those who live here permanently, however, life isn't so charming. The country with the highest mountains on earth is also one of the poorest. The CAD\$170 or so that a tourist may plunk down for a few nights' stay at a hotel here is more than what the average Nepali earns in a year.

In a country so badly endowed with

just about everything except spectacular scenery, there are plenty of contributing factors to national poverty. One of the most pervasive is an energy shortage matched by few nations on the globe.

Nepal has no known resources of oil, gas, or coal, and generates only half of the electricity it uses. Its oil import bill soaks up the equivalent of one-third of its export receipts. One of the few energy resources it does have — the forests whose firewood supplies 87 percent of fuel requirements — is fast disappearing.

Out of sheer necessity, the average Nepali consumes energy at one of the lowest rates in the world (the equivalent of burning 14 kilograms of coal a year). A tourist may expend more energy just jetting to and from Nepal.

Despite the country's miserly consumption rate, Nepal is still desperately short of energy, a fact that is visible everywhere.

In the highlands, where most of the

country's 15 million people live, hills are ringed to their crests with terraces of rice, corn, and sugarcane — nearly all unirrigated because in many cases farmers lack power to run the necessary pumps.

Left to the severities of Himalayan weather, these crops will probably produce another of Nepal's chronically poor harvests, which have rendered the nation unable to feed itself. Slopes too steep for farming also bear the wounds of having been stripped of the forests that once covered them: the deep, red scars of worsening erosion.

On the narrow roads that snake through these hills, vehicular power is replaced, often as not, by human energy. Goods, crops, and firewood are transported in cone-shaped baskets on the backs of men, women, and children.

The uneven little houses of wood or local brick, often plastered with orange-pink dried dung, have never known a lightbulb. Only 4 percent of Nepali



homes have electric power.

Is Nepal — and, by implication, other similar Third World energy “have-not” nations — an irredeemable energy basket-case? Not necessarily. Nepal may be energy-poor, but it is not energy-bankrupt. It is downright rich, in fact, in a few exploitable energy resources.

One of these is hydroelectric power. For its size and population, Nepal is blessed with one of the largest potential hydroelectric capacities anywhere — an estimated 14 500 megawatts, or over half as much hydropower as the whole of Asia now generates. But it has harnessed only about 35 megawatts. This neglect is coming to an end, mainly due to the skyrocketing price of oil during the 1970s.

Tapping more of Nepal's vast hydropower potential on a large scale would cost much time and money, as the years of construction and CAD\$146 million pricetag of the just-completed Kulekhani dam project has indicated. To minimize time and cost, the government is now giving priority to small-scale installations.

The bright promise they offer can be glimpsed at the site of one small water-turbine on a river gorge near the hill village of Kheste, about 40 miles west of Kathmandu.

The owner, Ram Nath Adhikari, a young father wearing the typical Nepali cap resembling a soft, pinched fez, converted his mill a year ago from an old wooden water wheel to a 12-kilowatt electric turbine.

The new equipment enables him to dehull rice and press mustard seeds — jobs the old water-driven grind-stones couldn't do — as well as mill wheat into flour. Like others of its kind, the turbine also is capable of supplying electric lighting to a village. Larger versions can pump irrigation water.

Mr. Adhikari bought his turbine with a low-interest loan of 79 000 rupees (about CAD\$7300) from a government agricultural bank. He already has begun to repay it from his increased income.

Nepal has helped finance more than 60 such turbines. Some 150 more (including Mr. Adhikari's) are being added under a multifaceted agricultural credit project funded by a US\$15 million loan from the Asian Development Bank, a Manila-based multilateral lending institution of 45 member countries, including Canada.

A more likely energy resource, which Nepal possesses in abundance, is livestock. The country has one of the highest ratios of cattle to people in the world: 10 million cattle among 15 million Nepalis. What makes this statistic an energy resource is an inevitable livestock by-product — dung — and the potential for turning it into biogas fuel.

Visits to a few of the country's 1200 functioning household biogas plants reveal the possibilities. One such unit is found at a home on the outskirts of Kathmandu. Next to the cattle shed is

buried a small cement dome, into which are fed dung and water. This mixture decomposes into methane gas, which is piped into the house. It supplied enough fuel for all the family's cooking, as well as standby gas lighting when the local electricity fails.

Mrs Rama Devi Dhungana happily recounts the monthly savings for the family budget: 30 litres of kerosene (about CAD\$13), one cylinder of bottled gas (about CAD\$18), and 10 kilograms of firewood (about CAD\$3).

In addition, the leftover slurry fertilizes an adjoining cornfield — saving the cost of commercial fertilizer while reaping higher yields, since the slurry is richer in nitrogen.

These savings far exceed the cost (about CAD\$9 a month) of the low-interest, seven-year government loan which the family took out to buy the biogas plant. It is one of 2000 units being installed under another phase of the Asian Development Bank agricultural credit project.

Another potential energy resource in Nepal is the replenishment of a badly depleted one: the forests.

Despite greater exploitation of biogas and hydropower, firewood is destined to remain the prime fuel of most Nepalis for years to come. The cloud darkening this prospect is a scarcity of firewood that already is putting a heavy strain on rural families. Gathering a household's daily supply often takes a full day's labour by one family member. Buying a week's supply frequently costs several days' wages.

Nepal's salvation may be that forests are, after all, a renewable resource. There is evidence that some of its cut-over forests can be restored, and soon enough to bring firewood relief in a few years.

Along Nepal's southern border with India, where the Himalayas suddenly diminish into a sunken plain known as the Terai, forests blanketed the land as recently as the 1950s. The eradication of malaria unleashed waves of settlers, and today barely 5 percent of the region remains wooded.

Scarcity of firewood has become a major problem, and wood is hauled in from as far as 100 miles away. Tattered forest remnants and grazing lands are being replanted with fast-growing species of trees that can produce firewood in 10 years. Two-year-old plantations of eucalyptus trees already sprout two to three metres tall.

A careful management program has been designed to assure a continuous supply of firewood — 53.5 to 61 thousand cubic metres of it per year — for generations.

This reforestation, financed by Asia's regional development bank and the OPEC Fund for International Development, is a forerunner of others now being planned in other parts of this energy-hungry kingdom. □

*Peter C. Stuart is information officer of the Asian Development Bank.*



*Instead of hauling wood, peasants in Nepal may soon be growing it*

## FARMING TREES

The energy squeeze in Nepal's Terai region catches small farming families in an ever-tightening circle of scarcity.

Fuelwood accounts for about 87 percent of wood consumption, and the green foliage of trees provides much of the fodder that sustains animal production. Shortages of fuelwood have forced rural households to burn animal dung or forest livestock fodder to meet cooking and heating needs.

Depriving animals of adequate food, and the soil of their fertilizing manure, will aggravate scarcity.

Forest areas are plundered by local communities, because trees and grass are regarded as free goods to which everyone is entitled. But whereas communal woodlots are threatened by over-cutting and overgrazing, trees growing on or close to individual homesteads are protected by the people who depend on them directly for fodder and fuel.

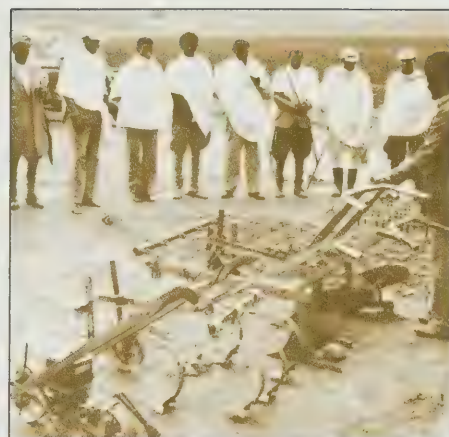
Asked how they thought forestry problems could be solved, the farmers in one district said, in essence, by planting trees on our own land. With a grant from IDRC, Tribhuvan University's Institute of Forestry in rural Hetauda in south central Nepal will develop a farm forestry system to do just that.

Researchers will test and select Nepali and exotic species of trees and develop planting and growing practices for the best performers. If farmers develop the practice of planting trees on their own land to satisfy their own needs for fuelwood, fodder, green manure, and small timber, they may be able to loosen the grip of scarcity and poverty.

Part of the solution to Nepal's energy problems may lie in not being able to see the forest for the trees.



(Right) Single-yoke oxen experiment. (Far right) Farmers at Debre Berhan, Ethiopia, attending a demonstration of improved farming implements.



# PULLING THEIR WEIGHT

*Draught animals in Africa*

DAVID SPURGEON

If Africa is to meet its food needs, farmers must intensify production dramatically. Getting more food energy out of a production system means putting more into it — in most systems this means increased mechanization and traction power. It is estimated Africa will require the energy input of several million tractors to meet its food demands at the turn of the century, a requirement that seems virtually unattainable.

Achieving at least some of the required energy input from sources closer to hand might not be so impossible, says the Ethiopia-based International Livestock Centre for Africa (ILCA). A substantial portion of the future energy demand could — and must — be met by using draught animals. A recent study of the Centre on animal traction in sub-Saharan Africa points out that, in Africa, animal traction is a more practical alternative than tractors because of the rising costs of gasoline, the loss of foreign exchange involved in tractor purchase, and the difficulties of maintenance. Tractors are also too expensive for most smallholders in Africa to buy.

ILCA estimates there are just under 10 million draught animals in sub-Saharan Africa. By improving their performance, as well as their numbers, ILCA estimates that "animal traction could supply African agriculture in the year 2000 with four times more energy than it did in 1975."

The extent to which this additional energy input might bridge the gap between power supply and demand is even more significant. Between now and 2000, food productivity will have to increase by between 50 and 100 percent: This increase in productivity entails a similar increase in future power demand to sustain it. Using past trends for energy sources, ILCA calculates an energy shortfall of at least 20 percent of the future power demand. Yet "... if animal traction were developed ... over half this deficit might be made up. Furthermore, the share of animal traction in bridging the power gap in eastern Africa and the Sahel could be well over 60 percent. ..."

Strange though it may seem, animal traction has only recently begun to spread across sub-Saharan Africa, except in Ethiopia where animals have traditionally been used for draught purposes. African smallholders have tended to concentrate on crop production and have left animal husbandry to herders, while the herders have shown little interest in crops. The result has been a separation of agriculture and pastoralism, with neither farmer nor herder using animals for draught. In the whole of sub-Saharan Africa, humans supply 92 percent of the energy put into

agriculture, working fields by hand, while animals provide a further 7 percent and tractors 1 percent.

Early attempts to introduce animal traction to cultivation practices were made during the colonial period in some parts of Africa, mostly for export crops. After gaining independence, a number of African countries turned to mechanization of agriculture to accelerate development, and animal traction went into decline. But mechanization efforts soon ran into serious dif-

ficulties, rekindling interest in animal power.

The emphasis now is on improving the implements to be drawn by animals; improving the efficiency of the animals themselves through better breeding, feed and husbandry practices; and the integration of farming and animal husbandry.

Many of the implements currently used by African farmers need re-designing. "The neck yokes used are sometimes crude and poorly designed, preventing animals from generating their full tractive power," says the ILCA study. "In India, it was found that well-designed yokes and harnesses can lead to performance gains ranging from 22 to 60 percent in relation to local yokes, according to the type used".

Cost is another limiting factor. "A set of draught equipment, including a multi-purpose toolbar with plough, harrow and weeder as well as a cart and seed drill, costs at present around US\$600-700, or over US\$1000 if a pair of oxen are added," says ILCA. As a typical farm has a gross income of about US\$600-700 a year, "a set of draught equipment costs 1 to 1.5 times annual farm income and an even higher proportion of net income."

But while the costs are high, the productivity gains can be higher: 20-25 percent for millet and groundnuts in the arid zone, and 50-100 percent in humid areas with rainfed rice and maize.

In 1979, ILCA began investigations into the use of crossbred oxen, which weigh more than local breeds and produce more draught power. This combination of better implements and animals also makes possible the cultivation of additional lands previously too difficult to work.

ILCA has also begun research on the joint use of cows as milk producers and as draught animals. If results show that cows can be fed and managed to work without significant penalty to either reproduction rates or milk yields, a new and far-reaching development will become available to the smallholder.

Animal traction has a great potential in Africa, the report concludes, but one that has been denied by some of the obstacles encountered in traditional small farming practices. Not the least of these is a "marked prejudice against a technology labelled old-fashioned." With new research and a new understanding of animal traction, ILCA hopes to turn that potential into real food and income for Africans. □

*David Spurgeon was formerly science writer at ILCA. This article draws on Bulletin 14, Animal Traction in Sub-Saharan Africa, ILCA, P.O. Box 5689, Addis Ababa, Ethiopia.*



*Rural artisans  
aid farmers  
and stimulate  
development*

## FORGING AHEAD



LUC-ADOLPHE TIAO

If you asked him, Démé Sidiki would not say he was a wealthy man or a driving force behind development. Yet in Kolonkan, an isolated village in the savannah country of northwestern Upper Volta, Mr Sidiki is both.

Kolonkan has scarcely 1000 inhabitants. Twenty of them work in Mr Sidiki's farm implement shop, turning out about 200 ploughs and 50 hoes every year during the unproductive dry season from November to June. The value of a plough in Upper Volta is 25 000 CFA francs (about CAD\$85). In a country where the average per capita income is about CAD\$150, the sale of 200 ploughs a year makes Mr Sidiki a successful entrepreneur.

He is one of 1000 rural artisans trained over the past 10 years at the National Centre for the Training of Rural Artisans (CNPAR). Based in the Voltaic capital of Ouagadougou, the Centre has training units in several regions of the country.

Successful rural industries are thought to stimulate development, supplying jobs and low-cost goods where they are most needed. But until a study was carried out in the Volta Noire region of the Upper Volta by the University of Ouagadougou's Study Centre for Documentation of Economic and Social Research (CEDRES) not much was known of the actual effect of rural artisanal industries. Funded by IDRC, the CEDRES study covered 400 farmers and artisans.

Every region of Upper Volta has artisans, the study discovered, and their work is generally linked to the needs of small farmers. The majority are blacksmiths who produce ploughing implements.

Other artisans have entered relatively new fields such as bicycle repair and well construction. When people travel in Upper Volta, most go on two wheels rather than four. But bicycles, which are particularly useful in the villages, need good maintenance to stay useful — which may explain the growing number of rural young people involved in the bicycle repair trade.

The artisans who have chosen well construction or carpentry have had greater difficulty in achieving success. When the clientele are poor rural people who cannot afford dwellings with expensive framing or corrugated roofs, for example, business is slow. And concrete wells are even farther out of reach financially.

The CEDRES study has proven that artisans can become a driving force behind rural development. Mr Taladidia Thiombiano, Director of the Graduate School of Economics (ESSEC) of the University of Ouagadougou, and the man in charge of CEDRES, explains: "Historically, the devel-

*More people roll on two wheels than four in Upper Volta: repair is an essential service.*

oped countries began to 'take off' as a result of cooperation between artisans and farmers. The artisans made it possible to increase production in the agricultural sector. There are parallels with that historical situation today in Upper Volta, and the activities of the artisans could accelerate our development process."

Some observers believe the economic growth of the Volta Noire district — the largest cotton-growing region in the country — is due in part to cooperation between artisans and farmers. "Wherever we have gone, the farmers have asked for more artisans, especially blacksmiths," says Mr Gadiaga, a CEDRES researcher and professor at ESSEC. Where the blacksmiths have produced quality material at affordable prices, he says, the Volta Noire farmers have been able to increase the land area they can cultivate and increase agricultural production.

Mr Thiombiano has found that some of the artisans have a significant capacity for innovation. In Kolonkan, Mr Démé Sidiki developed ploughs with a double moldboard. According to Mr Gadiaga, this improved plough enables farmers to work more quickly. Mr Démé Sidiki's operation is also efficient compared to those of some artisans. While he can make a plough in one day, it takes another (non-CNPAR-trained) colleague in nearby Kouggny village four or five days to manufacture the same implement.

The impact of other trades, however, is much less obvious. It is hard to know to what extent carpentry and masonry have really benefited farmers or improved the standard of living of the artisans themselves. Because of this, the researchers suggest further development efforts be concentrated more on smithies and their forges.

Even in the case of forges, however, it would be a mistake to think that the situation for artisans is as good as it might be. According to Mr Thiombiano, the results of the CEDRES study have shown that the artisans are faced with obstacles involving equipment, raw materials, and marketing.

In theory, when they leave CNPAR, the artisans are entitled to a certain amount of material or a small loan from the government in order to get started. In practice, however, the means made available are inadequate. Some artisans have had to abandon their trade before they even begin to work in it.

A scarcity of raw materials often increases the cost of the finished products, a difficult position to hold in a poor market. Rural artisans must also face competition from imported farm equipment as well as goods manufactured in relatively modern factories.

According to Mr Gadiaga, Démé Sidiki the Kolonkan blacksmith had to take risks in order to capture the regional market and, after that, part of the national market: for instance, he had to sell his ploughs on credit to farmers in several villages. But the risk had its rewards. Now, a few years later, Sidiki equipment can be found in many regions of the country.

What should be done to multiply the Sidikis of Upper Volta? Set up a credit structure for artisans, develop cooperatives?

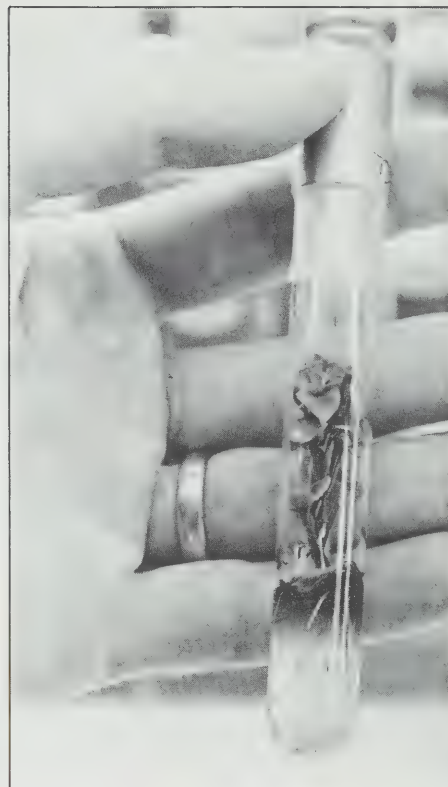
The CEDRES study demonstrates that, when organized and able to take advantage of opportunities, artisans can provide basic support for development of the rural sector. Training of rural artisans is therefore vital. In its own way CNPAR has helped. It has trained 1000 artisans — 1000 potential driving forces of development. □

*Luc-Adolphe Tiao is head of national news at the Carrefour africain, Ouagadougou, Upper Volta.*



Roots and tubers (right) are bulky material that need to be planted every year. The Tissue Culture Lab at IITA has developed a safe storage in vitro of roots and tubers, by means of the meristem-tip culture method. (Far right) About 400 clones of sweet potato grow slowly in their test tubes and require less space and time than reproduction in the field.

Photos: IITA



## BANKING SEEDS

GUN LUNDBORG

It was some 60 years ago that Russian geneticist N.I. Vavilov revealed the existence of "reservoirs of genetic variability" in different parts of the world. One was identified in Ethiopia, another was later discovered in West Africa by other geneticists: 12 centres, all in the tropics, were identified.

Once the world was a vast reservoir of genetic variation. In centuries past, indigenous African crops were confronted by new ones arriving through the caravan routes and from over the sea: sugarcane, bananas, chickpeas, cassava, maize, sweet potatoes and groundnuts. The best plants were selected by farmers year after year and their seeds stored until the next season. Natural crosses with wild relatives made the varieties more adaptable.

But today's mechanized farming, herbicides and chemical fertilizers are based on a narrow range of cultivars, intensive land clearing, and re-seeding of over-grazed pastures — all of which are leaving behind a wasteland of genetic erosion.

It was to save Africa's fast-diminishing genetic resources of crop species that the International Institute of Tropical Agriculture (IITA), based in Ibadan, Nigeria, established its Genetic Resources Unit (GRU) in 1975. Its main aims are to collect, conserve and study food legumes, rice, roots and tubers and their wild relatives that have been growing south of the Sahara for the past 3000 or 4000 years.

Many important food crops, such as cowpeas and yams, probably originated in Africa. Although at least six species of rice are considered indigenous to the continent, the African rice *par excellence* is *Oryza glaberrima*, an annual plant with red grains, still grown in some areas. According to Dr Quat Ng, the head of the GRU, this variety is in danger of extinction: Because of low yields and storage difficulties, many farmers have stopped cultivating it. Dr W.M. Steele, who has documented much of the genetic material at the GRU, notes that one of every 10 known species of wild plants is either extinct or in danger of extinction.

The GRU's West African location was not only an ideal starting point for the 38 exploratory missions to 18 African countries it has undertaken since 1976, but also a convenient place to bank the 20 000 specimens or "accessions" accumulated by its geneticists. These include cowpeas, rice, maize, groundnuts, lima beans, African yam-beans, cassava, yams and sweet potatoes.

The GRU genetic bank preserves seeds in an operation that depends on perfect storage. First, seeds are cleaned, fumigated, and dried to a humidity content of 6 percent.

They are then classified, assessed and documented.

Every year about 10 000 plants are grown at the GRU, the most important being rice and cowpeas. Seeds earmarked for long-term storage — 50 years of more — are called the "base" collection. They have to be sealed in aluminum tins and kept in a room at -20°C at a relative humidity of 60 percent (Temperature and humidity are the two main factors influencing the rate at which seeds age). The "active collection" is in short-term storage at 5°C and 40 percent humidity. Here the seed will remain viable for at least 10 years.

Because lifespans vary not only among seeds of different species but among seeds of the same species, the GRU therefore periodically tests its seeds. Whenever the germination rate drops to 85 percent, it is time for rejuvenation, that is, seeds are grown into plants to provide fresh new seeds.

Harder to store than seeds are the GRU's roots and tuber plants. Because cassava seeds do not reproduce the characteristics of the mother plant, stems have to be planted every year. Yams, which do not flower regularly or easily, are also reproduced vegetatively by means of their tubers rather than from true seed.

The Tissue Culture Laboratory at IITA uses a technique for safe storage and maintenance of such plants that involves keeping plant materials in an artificial environment at a temperature range lower than normal for tissue culture. The growth of the plantlets is therefore very slow; in fact, some have been stored up to 28 months this way. Growth becomes normal once the plants are put into a new medium.

After its field trips to the "reservoirs of genetic variability", the GRU distributed samples to its agricultural research organizations. Samples have also been sent out regularly to research stations and breeders around the world. There is thus a continuous flow of germplasm from Ibadan. Unfortunately for the GRU, no new material is coming in, because for two years there have been no funds available for collection missions.

And though distribution is free and the only condition of loan is that the borrower provide some feedback, this commitment is seldom respected. It is a dangerous sign. The world community must contribute to the preservation of genetic resources now, and not realize their value the hard way — after they are gone. □

Gun Lundborg is a contributing writer at IITA.



*Dr Simon Ngale Lyonga is an agronomist and director of the Institute of Agricultural Research (IAR), at Ekona, near Douala, Cameroon. IDRC met with him to discuss his research into root crops, particularly the yam.*

*From 14 to 19 August 1983, the Second Triennial Symposium of the International Society for Tropical Root Crops — Africa Branch will be held in Douala, Cameroon, under the auspices of the National Tuber Improvement Program, IAR, and the General Delegation for Scientific and Technical Research. About a hundred African researchers will gather to discuss the production potentials of root crops.*

*"This symposium," says Dr Lyonga, "clearly shows that Africa now has greater resources at its disposal to carry out the research required to ensure its development."*



*Dr Simon Ngale Lyonga*

## YAMS HAVE THEIR REASONS

JACQUES DUPONT

**IDRC:** Dr Lyonga, you have been interested in yam research for a long time. Why is that?

**Dr Lyonga:** During the 1960s, the Cameroonian government wanted to put a stop to the massive importation of yams from Nigeria. In 1968, it set up a program, the West Cameroon Yam Scheme, to supply germ plasm materials and strategies to the Ministry of Agriculture. We collected 114 yam specimens, and established 69 cultivars and 9 species — three of the species were completely unknown in Nigeria, which is by far the world's greatest producer of yams. A good many of the varieties we inventoried had been imported from Nigeria. We evaluated the nutritional qualities of the yam — including the crude protein content, which in some species came to 11.5 percent — and tested promising varieties with consumers.

**IDRC:** How long did all this take?

**Dr Lyonga:** We actually started in the early 1970s and finished in 1974 or 1975. We then went on to examine ecological and environmental factors — which varieties could be grown on the highlands, which at lower altitudes and on the low plateaus. We were able to identify 10 elite varieties: two adapted to the highlands, three to the low plateaus, and five to all altitudes and climatic conditions. Of course, other factors — spacing, staking, fertilizer requirements, harvesting, weeds and diseases — were examined as well.

**IDRC:** That's a lot of new information.

**Dr Lyonga:** Yes. And we wanted to share it with the peasants. You know, 90 percent of the people of Cameroon are rural people. Most of them grow yams and eat them two or three times a week.

**IDRC:** So what did you do?

**Dr Lyonga:** Well, the government allocated 37 million francs CFA (about CAD\$148 000) to us, so that we could put together an information package on yam production for agricultural extension workers to take to the peasants. We also produced 100 tonnes of setts (seed pieces), but never succeeded in meeting the demand. I should point out that one hectare of yams provides enough setts for planting only three or four hectares. Each hectare takes half a tonne of setts. Imagine the difficulties. In the case of rice, each hectare supplies about 50 hectare's worth of seeds! And it takes two or three years before a crop of yams can be harvested — the yield is too small and the waiting time too long.

**IDRC:** Then there is not much incentive to grow yams?

**Dr Lyonga:** Even compared to other tubers, yams require

a great deal of investment. The investment for sweet potatoes is 40 000 to 60 000 francs CFA per hectare; for cassava, about 45 000 francs CFA. But for yams, the figure is 300 000 CFA. The difference is enormous for small farmers.

**IDRC:** Then why do they continue growing yams?

**Dr Lyonga:** Because they like them. You can't change eating habits over-night. Luckily, Cameroon eventually came to export yams to Gabon, the Central African Republic, and other countries — mainly as a result of the government's research and extension work.

I'll tell you a story. At one time, Nigeria wanted to discourage its people from growing and eating yams. When production went down, you know what happened? Imports shot up. The yam is a basic part of Nigerian life. It has a religious significance, it's enjoyed at harvest ceremonies, and so on. That explains why Nigeria had to continue producing yams after all, and why it now produces 60 000 000 tonnes per year. Cameroonians also like to eat yams — two or three times per week, although the price is double or triple that of plaintain, for instance.

**IDRC:** Is the basic research on yams complete?

**Dr Lyonga:** No; not at all. Let me describe what yams should be like in the future. The plant should be sturdier, so that there would no longer be any need for staking, which is very expensive in terms of labour. The tubers should be rounder and closer to the soil surface, so that harvesting can be mechanized. Right now, this is out of the question. As well, yams should have a higher protein content and a lower carbohydrate content. It should be possible to develop yams that yield more setts. At the regional conference of the International Institute of Tropical Agriculture held at Ibadan in 1980, the participants agreed to form a committee of specialists — agronomists, economists, pathologists, etc. — to look into these various improvements.

**IDRC:** And once the research has been done, how will it be used?

**Dr Lyonga:** Here, as elsewhere, agricultural extension work is tremendously difficult. Just after receiving my first degree in agronomy, when I was an agricultural extension worker, do you know how many farmers I was responsible for? In a similar job in Europe or America, an extension worker would have 200 to 300 farmers to visit. I had 10 000. Just imagine. I couldn't even *hope* to meet them all. Of course, Cameroon needs people trained in all areas, including agricultural extension.

**IDRC:** One last question. What do you foresee for the yam?

**Dr Lyonga:** I think that, eventually, people will stop eating so much yam and will therefore grow less of it. It will become more of a garden crop.



## FROM FALSE GUILT TO TRUE RESPONSIBILITIES

CARLOS RANGEL

*The following are translated excerpts from The West and the Third World: from false guilt to true responsibilities, by Carlos Rangel\*.*

Carlos Rangel was born in Caracas, Venezuela in 1929. He has academic degrees from institutions in France and the United States, has served as a teacher and a diplomat, and is now a journalist and television producer and broadcaster in his native country.

As Jean-François Revel notes in his introduction to the book, "the governments that dominate the planet today have no interest in implementing ways of reducing the inequalities between rich and poor nations, because the political and ideological exploitation of those inequalities is more lucrative than their correction." Rangel, he adds, goes even further to assert that the Third World is being used as a weapon in the battle between the ideologies of East and West.

**T**he ideological force of Marxist historicism comes from its ability to satisfy emotions by rationalizing them, and at the same time remain impervious to reasoning based on facts. Wherever they may be, those who are dissatisfied with themselves or with their status in the world tend to accept the general assumptions of this saving historicism and its procession of gods and demons. In particular, it is now accepted as a matter of fact needing no demonstration that capitalism and the Westernization of the world over the past two centuries are the root of all evil. Humanity will be saved when a Lucifer called "imperialism,"

embodied in a few advanced capitalist countries, disappears; the weakening and eventual destruction of these countries will be equivalent of the Last Judgment.

There is also a new paradox: Marxist-Leninist socialism is repugnant to the advanced industrial societies in which it should theoretically have taken root. But since 1945 it has spread from the Soviet Union significantly only to the poor or underdeveloped countries; some of these adhere strictly to orthodox Marxist-Leninist ideology. Others, to varying degrees, declare themselves "non-aligned", yet more or less recognize the Soviet Union as a friend and natural ally of the Third World — an admission Fidel Castro succeeded in eliciting at the conference of non-aligned nations held in Havana in 1979. Almost without exception, socialists — not only the Marxist-Leninists but also

the democratic socialists and even the social democrats — have become obsessed by the idea that henceforth socialism can and must gain ground primarily in the poor, underdeveloped countries. Socialists believe developing countries are predestined to take over from the corrupted proletariat of the Western world as the essential force in history.

This attitude and the underlying tissue of ideas, beliefs, and feelings make up *Tiers-mondisme* or a Third World ideology. It is an ideology that is both ambiguous and simplistic. In spite, or perhaps because of this, *Tiers-mondisme* has become the vital, most widely shared element of socialist thought, used to compensate for failures and setbacks in so many other areas. This situation would have been enough to make the hair of the original socialist theorists, particularly Marx and Engels, stand on end. The idea that there could be an affinity and even an alliance between socialism and underdevelopment would have seemed to them quite simply barbaric and dangerous.

### WHAT IS THE THIRD WORLD?

The peoples included in the *Tiers-mondisme* definition of the Third World form — from geographic, historic, demographic, economic, and all other points of view — a mosaic of staggering variety. Side by side are stratified societies, areas experiencing relative stagnation, and others undergoing violent change or even economic progress and rapid modernization and offering great social mobility. Some regions have a stifling population density,

while others are almost depopulated. Included alike are the Westernized inhabitants of ultramodern metropolises and native peoples still living in a kind of Stone Age.

Clearly, the reason such diverse groups are all put together under the same label is neither their poverty nor their underdevelopment, since these problems existed before this Third World ideology came into being. If such problems were the determining feature of the Third World, a number of "socialist" countries would also have to be added.

### BEFORE THE THIRD WORLD

The Third World only very recently made an appearance as a problem, or universal preoccupation or factor determining attitudes and events. Confronted with poverty and relative or absolute powerlessness, people had always grudgingly accepted that these were "facts of life."

Differences in the living standards of two countries brought into contact, as for example, France and Egypt during the Bonaparte expedition in 1798, were considered neither shocking nor scandalous. The people did not feel that an injustice had been done by one to the other, or that there was any great urgency to bridge the gap. And, naturally, no one thought of making France — the more advanced country — responsible for an age-old situation that might improve only if the forces that had shaped the Western world could shake the non-Western countries out of their undeniably underdeveloped state.

### THE ACHILLES HEEL OF THE WESTERN WORLD

Today, consciously or not, almost everyone takes it for granted that the

*Commentary provides a forum for readers to explore topics raised by Reports, or to present alternative perspectives, informed opinion, and analyses of development issues. The views published are not necessarily those of the editors or IDRC.*



advanced capitalist countries developed solely, mainly, or at least to some significant extent by "plundering" the so-called proletarian nations. An "aristocracy" of imperialist nations is thought to have established a stranglehold on the surplus value from the work and natural resources of the others.

There are many in the West today who are secretly convinced or will openly admit they owe their well-being, relative to the Third World, to a series of shameful, indefensible actions. Western society in their eyes has consequently discredited itself, is basically inhumane and corrupt, and deserves to be punished, and even toppled, by any means possible. The West will never again find that "human face" — that perhaps it never had — unless it gives itself over, submits to the intuitions, values and vision of the allegedly superior world of the "oppressed".

This masochistic, suicidal, feeling of guilt has deeply penetrated the whole of Western society, to the point where it could become, if it is not already, the Achilles heel of the Western world. Discouragement, apathy and paralyzing guilt feelings originating among leftist intellectuals have spread to all the vital, influential parts of society: non-Marxist political parties, the Church, universities, union leaders, public servants, the press, the middle classes and, eventually, the army.

THE WEALTH AND POVERTY OF NATIONS

Not so long ago, development literature was very widely accepted, as it still is for the most part, because it attributed the underdevelopment and poverty of the Third

World countries, and, very often, the prosperity of capitalist nations, to the relationships imposed by the latter on the former — that is, to imperialism and its corollary, dependence. This abundant literature (on which *Tiers-mondisme* is still based) was characterized by a peculiar absence of historical and cultural perspective, pretending to explain the wealth and poverty of nations without taking into account the disparities in geographical, cultural, economic, political and social conditions that existed in the various human societies before the least relationship developed between them. Having thus set aside some of the information most fundamental to the problem, the so-called "development experts" had no trouble stating simultaneously on the one hand that the growth of the capitalist countries was aberrant and parasitic (it would not have been possible without the sacking of the Third World) and on the other hand, that only imperialistic exploitation and the burden of dependence — that is, external, contingent, very recent factors — prevented the still poor and underdeveloped countries from experiencing comparable or even greater development.

On the basis of so glaring a contradiction and so enormous a deception there have been erected impressive dialectic structures with apparently no other purpose than to contribute to Third World propaganda and proselytism. Starting with these generalizations, proponents will attempt to show how, in certain particular instances, the attainment by some African, Asian or South

American country of such and such an objective, supposedly well-formulated, was hampered or even blocked by the mechanism of imperialism and dependence. To make their point, they will carefully disregard the fact that to the extent that these mechanisms do indeed operate as described, they require certain conditions: The social organism must have a prior vulnerability, comparable to the "immunological deficiency" to which doctors refer in describing a body which has no resistance to viruses or bacteria. No sane person would even think of saying that, had someone suffering from such a condition been able to remain in a sterile environment and avoid the slightest contact with the outside world, he would not only have kept in good health, but also easily have become an Olympic champion.

BEYOND THE THIRD WORLD

*Tiers-mondisme* is one of the central developments of modern-day history and also one of the most disturbing, if not surprising. How indeed, can one today dispute the overwhelming evidence that the introduction of socialism eventually leads to what soon becomes a monstrous reinforcement of the State, the gradual strangulation of civil society, and the emergence of authoritarianism and finally, totalitarianism?

Although some people still cling in good faith to the illusion that, regardless of repeated "experiments", this evidence does not hold true for advanced capitalist countries, no one (except fanatics and propagandists) can impugn it in the case of

the poor, underdeveloped countries. There is no denying that, far from undermining the prestige of *Tiers-mondisme* and preventing it from spreading, these inevitable consequences of socialism constitute its most powerful attraction. One then begins to have serious questions about the future of the freedoms inherent in capitalist civilization and its benefits.

THE LIMITS OF SOCIAL JUSTICE

Some of the recommendations of UNCTAD (United Nations Conference on Trade and Development) and of the Brandt Commission are opportune and workable. They should be implemented with all speed, abandoning the unproductive controversy over whether and to what degree the developed countries must sacrifice to compensate the developing countries for wrongs that the developed countries may or may not have done them in the past.

If the West does not want to find itself backed into a psychological and political bankruptcy, it must no longer accept the role of guilty culprit, letting itself be accused of all the misfortunes of the Third World. But that does not mean that it should turn away from what I call the "international social question", nor obstinately refuse to take into consideration the legitimate claims of underdeveloped countries — or even the less legitimate claims, provided that they are not conceived for the sole purpose of presenting unresolvable conflicts.

\*L'Occident et le Tiers-Monde : De la fausse culpabilité aux vraies responsabilités by Carlos Rangel, published recently by Editions Robert Laffont, Paris.



## Quality, not quantity

Twenty million children of the 23 million born in India this year will be physically and mentally impaired, according to Dr Coluther Gopalan, director of the Nutrition Foundation of India.

Based on past and present trends, 3 million of the 23 million children born in India in 1983 will die before their first birthday; another one million will die before childhood is complete. Of the remaining 19 million, nearly 9 million will suffer physical or mental impairment as adults due to serious undernourishment and poor health. Rounding out the 20-million figure will be an additional million who suffer from milder malnutrition and less obvious impairment.

Dr Gopalan made his comments to disturb current preoccupations with population growth and focus concern on the quality of life in India. (*International dateline*, The Population Institute).

## Bee news

A series of ten leaflets by the International Bee Research Association provides information useful to developing country beekeepers.

The series is published with support from IDRC, and includes as subjects suppliers of equipment for tropical and subtropical beekeeping, marketing of bee products, planting for bees, opportunities for training, and sources of funding for apicultural development, among other topics.

The leaflets are available without charge to developing country apiculturalists from the International Bee Research Association, Hill

House, Gerrards Cross, Bucks SL9 0NR, U.K.

## Understanding trees

For almost as long as agriculture has been practiced, farmers have combined trees, crops, and animals to get more from their land. Agroforestry (the modern term for this practice) may be one of the oldest and most widely spread land use systems, yet it is still one of the least understood scientifically.

As a result, agroforestry systems seldom yield their full potential. In a first step to correct this limitation, the International Council for Research in Agroforestry (ICRAF) is undertaking a global inventory of agroforestry systems. The Council plans to survey and document existing traditional systems to build up information that could be used to generate improvements in productivity.

ICRAF is appealing to all knowledgeable individuals and institutions to forward information through a network of regional coordinators.

For further details: Dr P.K.R. Nair, Coordinator, AF Systems Inventory Project, ICRAF, P.O. Box 30677, Nairobi, Kenya.

## A new breed of multinational

Multinationals based in developing countries and expanding into other developing countries are providing an economic alternative for industrial development.

A recent International Labour Office (ILO) study identifies about 2000 subsidiaries of developing country multinationals in 13 other developing countries, and suggests

that the South-South network of multinationals might actually be three or four times greater.

According to the study, such enterprises can help meet national employment goals, save capital and often reduce import costs. The original technological know-how of a Third World parent firm may have been acquired from an advanced industrial country. The technology transferred to subsidiaries is usually the result of adaptations and innovations appropriate to developing countries.

Labour intensity and flexibility characterize South-South multinationals. Southern subsidiaries are more likely to be smaller in scale, and produce a wide range of products or product models for the domestic market of the country in which they operate, says the report.

The weakness of South-South multinational enterprises is in manufacturing and marketing for export. The ILO suggests that joint ventures between multinationals of the South and the North could offer host countries some of the advantages of both — the job creation and servicing of domestic markets of Southern enterprises, and the foreign exchange earnings and technological transfers of Northern ones.

## Feminist research

"Women were first agriculturalists and although they still have a major role in the production of food and fibre for our planet, their role in this activity has been more or less ignored by social scientists and policymakers alike," says the introduction of a new reference work on women.

*Resources for feminist research/Documentation sur la recherche féministe*, an international periodical of research on women and sex roles, has attempted to correct some of this ignorance in a special issue on women and agricultural production.

Twenty-one articles document the many roles

of women in agriculture and rural society. Book reviews, descriptions of work in progress, an annotated bibliography, and a listing of film resources are intended to provide scholars and activists with access for information on research.

(RFR/DRF, Volume 11, number 1, 198 pages, CAD\$8.50, c/o Department of Sociology, Ontario Institute for Studies in Education, 252 Bloor Street West, Toronto, Canada M5S 1V6).

## Neem insecticide

For centuries before commercial insecticides were available, farmers on the Indian subcontinent protected crops with a natural repellent found in the fruit and leaves of the neem tree, *Azadirachta indica*.

Azadirachtin, a steroid-like substance in neem, apparently repels insects but is non-toxic to humans and animals. Neem cake, the residue of the tree's fruit, has been used as livestock feed in times of scarcity. Neem oil is used for soaps and a derivative is used as toothpaste in India.

The International Rice Research Institute (IRRI) has been exploring the use of neem as an organic, environmentally sound insecticide. Studies show insects feed less, grow poorly, and lay fewer eggs on susceptible rice plants sprayed with neem oil or that have absorbed azadirachtin systemically from neem cake applied in rice paddy. Spraying neem oil emulsion with an ultralow volume applicator gave adequate insect protection to a rice crop at a cost of only about CAD\$6 per hectare.

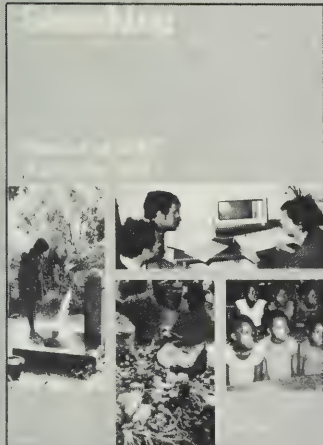
Current research goals include breaking down neem derivatives into their various biochemical components in order to evaluate their role in protection against rice insect pests and even rice diseases. A precise understanding of the action of neem fractions may lead to breeding programs to increase natural potency or the manufacture of synthetic analogues.



## Searching: review of IDRC activities 1982.

IDRC-212e, 40 pages.

The annual review of the Centre's activities for the past year, *Searching* provides a brief general accounting of programs: agriculture, food and nutrition; health; information; social sciences; and cooperative research. A particular research activity from each program area is highlighted, and a list of films and publications produced during the year is included. Also available in French and Spanish.

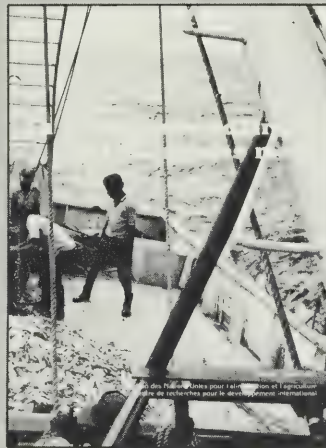


## A place to live: more effective low-cost housing in Asia.

Y.M. Yeung, editor. IDRC-209e, 216 pages.

This volume is intended to update and increase current knowledge on low-cost housing in Asia, reviewing specific housing programs and policies in Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Based on a seminar held in Bali, Indonesia, in 1981 in collaboration with the Indonesian Directorate

General of Housing, Building, Planning and Urban Development, the publication presents revised and expanded versions of papers presented then as well as new material.



## La pêche secondaire — un cadeau des mers : rapport d'une consultation technique sur l'utilisation des prises secondaires dans la pêche des crevettes, tenue à Georgetown, Guyane, 27-30 octobre 1981.

IDRC-198f, 163 pages.

This French translation of IDRC-163e *Fish by-catch... bonus from the sea* will be of interest to policymakers, administrators, and all personnel involved in fisheries development. It presents background documents and delivered papers from an international consultation that reviewed experience in the recovery, processing, and marketing of fish by-catch in all the developing regions of the world. A list of participants and a bibliography are included.

## Preventing school failure: the relationship between preschool and primary education.

**Proceedings of a workshop on preschool research held in Bogota, Colombia, 26-27 May 1981.** IDRC-172, 184 pages.

This workshop brought together researchers from many parts of the world and from different disciplines to discuss early childhood stimulation. The effects of preschool stimulation on the short- and long-term development of children and their success on entering the formal school system were examined in case studies and national programs. This is an English translation of IDRC 172s *Evitando el fracaso escolar: relación entre la educación preescolar y la primaria* published previously in Spanish.

## Vencimos: La Cruzada Nacional de Alfabetización de Nicaragua.

Luis Alemán, Lola Cendales, John McFadden, Germán Mariño, Mario Peresson, María Suárez, y Carlos Tamez. IDRC-189s, 242 pages.

This Spanish-language book is a historical account of the National Literacy Crusade in Nicaragua. The crusade was carried out not only as a massive educational campaign but also as part of a political process aimed at integrating disadvantaged social groups into the national effort for revolutionary change. The book focuses on three critical phases of

the crusade — its planning, preparation and implementation. After a discussion of earlier literacy programs, the authors detail the objectives and the strategies of the crusade, and present an account of training activities. The achievements of the crusade are discussed, as well as the subsequent preparations to develop a permanent adult education program from the literacy activities. (This publication will be available in an English translation.)

## Élevage des bivalves en Asie et dans le Pacifique : compte rendu d'un colloque tenu à Singapour du 16 au 19 février 1982.

IDRC-200f, 90 pages.

This French edition of IDRC-200e *Bivalve culture in Asia and the Pacific* presents a summary of a workshop at which the culture practices, postharvest handling, economics of management, and future research needs of bivalve culture — the rearing of oysters, mussels, and cockles — were discussed.





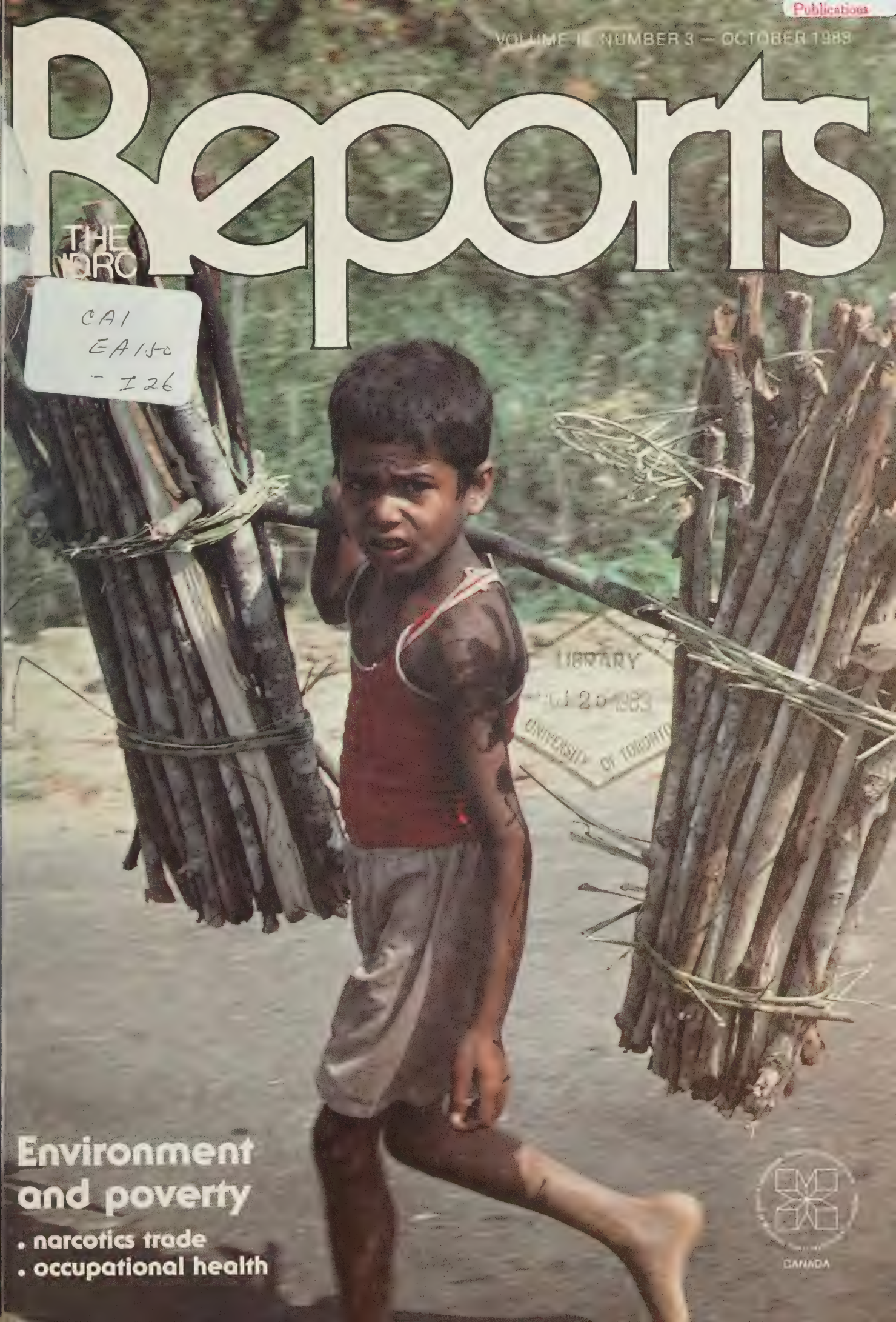
In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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## Environment and poverty

- narcotics trade
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CANADA



# LETTERS

## Another smoking hazard

I know there is also a very real concern in the Third World about the spread of smoking, about the promotional activities of multinational firms, etc. ("Up in smoke," *Reports* 12(2), July 1983). But I think that we will enormously help our campaign against the tobacco industry if we listen to what the Third World is saying to us about the damage that tobacco companies are doing to their land. I have reason for believing that the companies are very sensitive to this, very aware of the damage they are doing and are just hoping that the whole thing does not get publicity.

Earlier this year I went to see a large development project in Sri Lanka. The project consists of building four large dams across one of the country's rivers. The project is taking place in a very hilly area and one thing that strikes the observer is the hillsides above the project area are largely bare of trees. When the dams are built, and the rains come — the area has over a 100 inches (254 cm) of rainfall a year — it seems pretty clear that the rain will cause soil to rush down into the riverbed, and could clog up the dams and ruin the whole scheme.

But why have the hillsides become so denuded, I asked local officials? The most recent cause of the destruction, they told me, was that a local tobacco company had encouraged people to go up onto the hillsides, clear themselves a hectare or two of land and grow tobacco. When

the tobacco is grown they need even more wood to cure it. Local officials were extremely concerned about the way the tobacco industry was affecting the project and one of them said to me, in what seemed a plea for help, "When you in the West think of tobacco you think of smoking and health; when we in the Third World think of tobacco we think of the damage it's doing to our land."

A huge volume of wood is needed to cure comparatively small amounts of tobacco. According to J. Boesen and A.T. Mahele, authors of a book on tobacco production in Tanzania, peasant farmers use between 2 to 3 hectares of trees to cure one tonne of tobacco.

Tobacco manufacturers do claim to be introducing more efficient curing barns that need considerably less wood. Assuming that substantial efficiencies can be made, so that farmers only need use one hectare of trees to cure one tonne of tobacco — which is almost certainly an estimate favourable to the tobacco industry — then it appears that 2.5 million hectares of trees have to be axed each year to cure 2.5 million tonnes of tobacco.

According to the *Global 2000* report, some 18 to 20 million hectares of trees are being axed each year for all purposes. At a conservative estimate therefore, 2.5 million hectares are being felled for tobacco curing, that is, 12 percent of the total. One tree out of every eight cut down is used for curing tobacco.

Farmers need therefore to be encouraged to grow alternative crops for

tobacco. The World Health Organization has identified a number of alternative crops — cereals, pulses, most vegetables, sugarcane, bananas, coconut, pineapple and cotton. The question is whether the governments of tobacco producing countries are prepared to help their farmers switch from tobacco — farmers will be more willing to switch if the government does give more positive help.

Meanwhile, every cigarette packet should carry a double warning "cigarettes can damage your health and someone else's urgently needed land."

John Madeley  
Caversham, U.K.

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports, P.O. Box 8500, Ottawa, Canada K1G 3H9.*

## New IDRC office

The IDRC will soon open a South Asia Regional Office in New Delhi responsible for research projects in India, Bangladesh, Pakistan, Sri Lanka, Nepal, and the Maldives.

The office's first director is Mr Vijay Pande, an economist who for the past nine years has been the Ford Foundation's Assistant Representative for India, Nepal, and Sri Lanka. Prior to that, Mr Pande was Chief of the Research and Analysis Division in the Indian government's Trade Development Authority. He holds an M.Sc. in economics from the London School of Economics and an M.A. in economics from Delhi University.

Mr Pande accepted the post shortly after IDRC concluded an agreement with the Indian Ministry of Finance last June 2 to open the office.

The new operation is one of six IDRC regional offices. The others are in Cairo, Dakar, Nairobi, Bogota, and Singapore. The Centre's Asia Regional Office (ASRO) in Singapore has had responsibility for Centre activities in the South Asia area until now. The creation of the New Delhi office will allow ASRO to concentrate its efforts on the research needs of Southeast Asia and the Pacific.

The temporary address of the South Asia Regional Office is:

IDRC  
Room 120, Taj Palace  
Hotel  
Sardar Patel Marg  
New Delhi 110021,  
India



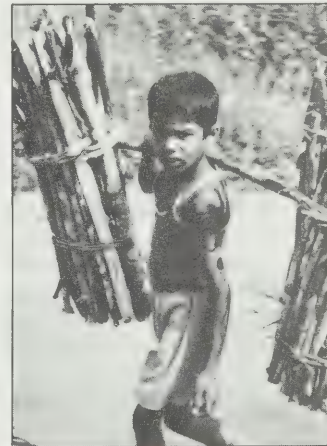
# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explorer* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Rowan Shirkie. *Associate Editors* French edition: Jacques Dupont; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee

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**Cover:** A young boy brings home firewood in Bangladesh. The environment directly provides for many of the needs of the poor in developing countries. When it is abused, so are they. See stories page 4 and following.

**Back cover:** Opium latex oozes from cuts made in an opium poppy plant. Stopping the illicit narcotics trade at its source requires ensuring a better livelihood for producers. See story page 16.

Photo: David Archibald

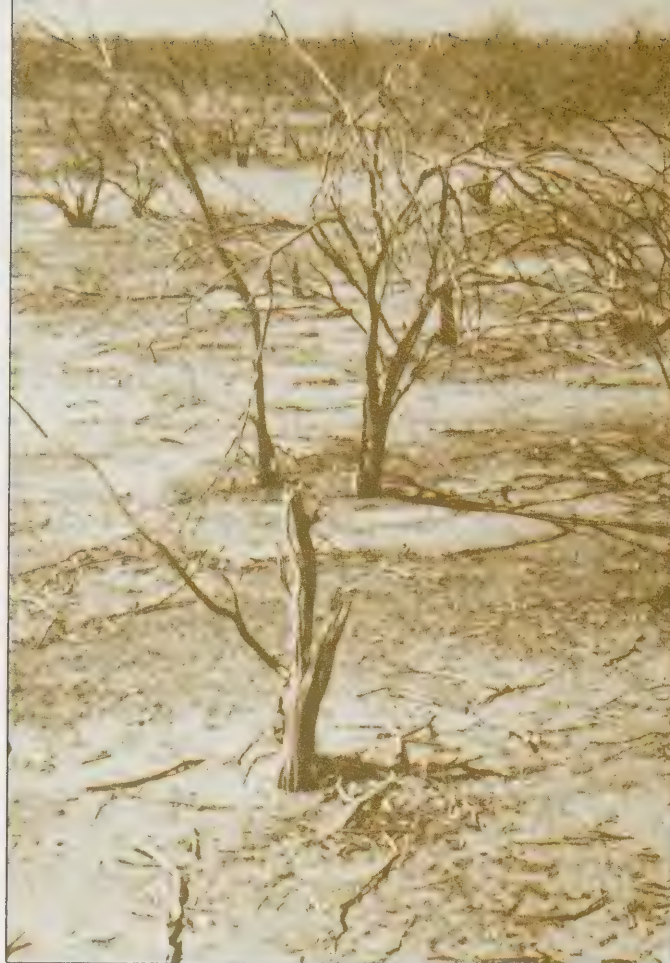
The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogota D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 El Messaha St., Dokki-Giza, Cairo, Egypt).

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# THE POVERTY OF NATURE

ENVIRONMENT, DEVELOPMENT, SCIENCE AND TECHNOLOGY

ANIL AGARWAL

**T**here can be no doubt that both the environment and development crises have become more intense over the last decade in the Third World. Poverty and landlessness have increased in the Third World and the world economy has stagnated. Environmental degradation has become increasingly worse. Yet the relationship between environmental conservation and economic development remains little understood.

There have been considerable changes in attitudes since the mammoth UN Conference on the Human Environment held in Stockholm in 1972, however. That was the first major international conference to focus worldwide attention on the environment. Hundreds of delegates from the Third World heard leading scientists and officials from the advanced countries speak about the destructive effects of industrialization on the biosphere in which the human population survives. There were fervent pleas that the developing world should not repeat the mistakes of the western world.

But there remained a sneaking suspicion in the minds of many Third World intellectuals and government

officials, at Stockholm and after, that this newfound concern for environment could easily hide a plot to hold back industrial development in the Third World. Having acquired all the material goods to meet their needs for a comfortable existence, the rich seemed to be also hankering for clean air and clean water to prolong their health, and to live in beautiful, undisturbed Nature for their recreation. But in the poverty-stricken developing world, the hardliners maintained, economic development was the primary concern before the finer environmental niceties could be considered.

Out of these contentions was born a debate on the conflicting nature of environment and development, which lasted most of the decade.

But at the same time, a strong body of opinion was emerging that argued that instead of there being a conflict between environment and development, the two are closely related. It

argued that a rational and egalitarian process of economic development, sustainable on a long-term basis, was not possible without ensuring environmental integrity. Contrary to what was said in the 1972 conference, non-governmental organizations active in the field of environment told the conference on Environment and the Future (held in Nairobi in 1982 to commemorate the tenth anniversary of the Stockholm conference) that the problem lies in the very nature of the current process of economic development.

The current process of economic development has not only failed to meet the basic objectives of economic development itself — eradication of poverty, creation of mass employment, and provision of basic needs — but it has also, slowly and steadily, destroyed the global environment and mortgaged the future of the world. There is no conflict between rational environmental concerns and a rational development process. The problem mainly lies in identifying and implementing the right development process and bringing the current maladjusted development process to an end.

*(Above) The remains of a forest in the Sahel. It is the poorest, most marginalized people who suffer when the environment — their greatest resource — is destroyed.*



FOR RICHER OR POORER?

The close and intense relationship between environment and development comes out strongly in *The state of India's environment: a citizen's report* published recently by the Centre for Science and Environment in New Delhi. Written in collaboration with various voluntary agencies across the country involved in environmental issues, the report is a review of the changes taking place in India's environment, and the effects on the daily lives of the Indian people.

The report points out, for instance, that though the officially stated forest area in India is about 23 percent of the country's total land area, senior officials readily admit that only about 10–12 percent has an adequate tree cover. There are no definite statistics about the rate of deforestation, but it is probably advancing at an unprecedented rate of one million hectares every year. As a result, the total area subject to periodic floods, estimated at 20 million hectares in 1971, now stands at 40 million hectares — literally a doubling of vulnerable areas in ten years.

Soil erosion too, has reached an unprecedented level. Every six months, more topsoil gets washed away than has been used to build all the brick houses across the country. A shortage of firewood has meant that the poor are turning, wherever possible, to the use of cowdung and agricultural wastes for cooking food. This means that in the areas practicing intensive agriculture, inadequate supplementation by organic manures is leading to a rapid depletion of soil fertility. The 1980–81 foodgrain output withdrew 18 million tonnes of plant nutrients from the soil, but farmers added back only 11 million tonnes. The Ludhiana district in the State of Punjab, which records the highest yields of many crops, now also records the highest deficiencies of plant nutrients in its soil.

Meanwhile, rivers and ponds are being heavily polluted. As one estimate puts it, 70 percent of all the available water in India is now polluted. Of all the major rivers in the world, the venerable Ganges is probably the most polluted.

But apart from such details about environmental deterioration, what the report shows most clearly is that in a developing country like India, which has a relatively high population density existing with a high level of poverty, it is difficult to find any ecological niche in the physical environment that is not used by some human group or another for its sustenance. At its extreme, even urban rubbish provides an ecological niche on which as much as one percent of the urban population of many Third World cities subsists: the so-called informal waste-recycling industry.

Unfortunately, the process of economic development has been either destroying these ecological niches or, even worse, reallocating the resources

available in these niches in favour of the more powerful groups in society. Increased poverty, marginalization and dispossession of the poor and powerless has become an inevitable result of this process. Environmental degradation and social and economic inequities, thus, go together almost as two sides of a coin.

DEFORESTATION AND AFFORESTATION

Forests, for example, play an important role in controlling floods, erosion and carbon dioxide production. They are also the habitat of millions of indigenous forest-based peoples, whose total number across the world equals the population of the United States. In India there are about 44 million tribal people. Growing demand for timber and timber-based products in the urban markets of the developed and developing world has led to the destruction of forests to meet commercial needs. Millions of trees are being destroyed; so are millions of forest people.

Growing concern about deforestation and shortages of firewood have



*Catching fish in a drying pond in Bangladesh: every possible niche in the physical environment is used to sustain someone.*

provoked several international and bilateral agencies to fund social forestry programs to meet the basic timber and fuelwood needs of rural communities. However, almost all the trees being planted in these programs are fast-growing commercial varieties, meant entirely for urban and industrial markets.

In the Singbhum area of Bihar, the tribals have been burning down the new forests of teak planted by the State forest department in place of the rich sal forests that had provided tribals with a wealth of herbs, fruits, food, timber and firewood. The destruction of forests has had a profound impact on the country's tribal population, which is facing an unprecedented social destruction.

In the state of Karnataka, bamboo once available to local people enabling them to construct their homes cost-free, is now Rs. 1200/tonne (CA\$156). The bamboo industry, primarily responsible for destroying the

bamboo stocks, pays a concessional rate of Rs. 15/tonne, however.

PASTURE LANDS AND NOMADS

Pasture lands are another major natural resource being taken away from their traditional users. These lands are generally marginal lands on which intensive cultivation should not take place. Nomads have used pastures with great care, over centuries, without causing environmental degradation. With the spread of irrigation and sedentary agriculture, more land has come under cultivation, and nomads are being pushed into more unproductive lands. In the process, both marginal lands and the nomads are suffering, as the fragile environment fails to provide even a bare existence.

Nearly 6 percent of the Indian population is estimated to be semi-pastoral nomads. But left without any natural resource base to sustain them, the nomads are being forced to migrate to the urban areas to work in the construction industry, or become landless agricultural labourers.

Meanwhile, development agencies and almost all forestry experts continue to portray cowherds as the main culprits of forest and land destruction because of their high densities of grazing.

COASTAL FISHERIES

Coastal fisheries are yet another resource that sustains millions of marginal people in the Third World. Growing demand for seafood like shrimp in the markets of the developed world has led to the introduction of capital-intensive fishing technologies, like trawler fleets. These technologies, introduced by multinational and national companies, are displacing traditional fisherfolk all over Asia.

Trawlers, through overfishing, are destroying the fishery resources. Recently, Indonesia banned the operation of trawlers from its coastal waters, and several countries, including India, have already enacted or are contemplating enacting regulations that would prevent trawler operations in the first 5 km of coastal waters, which would be reserved for traditional fisherfolk. However, policing trawlers over kilometres of water is an expensive undertaking, and regulations, therefore, are seldom enforced.

Meanwhile, river fisheries are being seriously affected by increasing water pollution and large-scale fish kills are often reported. In the 158-km stretch of the Hooghly River in India, the average yield of fish in the polluted zones of the river is only about one-sixth that of the unpolluted zones. The growing water pollution is seriously affecting millions of river fisherfolk in the country, but as yet no comprehensive data are available on their plight. The rivers have now become a resource for urban and industrial India, to be used as cheap dumpyards for their wastes — sanctioned in the name of economic development.



## POPULATION AND ENVIRONMENT

There are two major cases in which social groups may have outstripped the carrying capacity of the biosphere. Forty percent of the world's population, classified as the very poor, subsist only on 10 percent of the world's resources. While their population is growing, their share of world resources is diminishing, leading to an extraordinarily intensive use of the resources available to them. They may, in fact, be outstripping the carrying capacity of the environment on which they subsist. Environment and population literature is full of concern about the destructive impact of the poor on the environment.

Unfortunately, this is more like blaming the victim. Part of the reason for this extraordinarily intensive use of resources is that the poor are being dispossessed from their traditional resources and means of sustenance.

The world's top 30 percent, and especially the very rich amongst them, appears to constitute another group outstripping the carrying capacity of the world's environment. Little attention is paid to the destructive impact of the rich. Thirty percent of the world's population accounts for 70 percent of the world's annual consumption of resources.

This high per capita consumption arises out of an extraordinarily *extensive* use of the world's resources, which already appears to have overburdened carrying capacity. These socioeconomic groups are also responsible for the very poor being pushed into living on a smaller share of the world's resources, internationally and nationally. Japanese companies, for example, destroy one forest in Indonesia then move on to another forest in Papua New Guinea; just as an Indian paper mill moves on from forest resources in Karnataka, once they are destroyed, to those in distant northeast India.

It is the consumption patterns of these rich groups that should be of most concern to those working towards a sustainable world development process. The rich not only overconsume but also set the cultural ideals and consumption standards for the world's poor to emulate.

## THE IMPOVERISHED HUMAN RESOURCE

The spread of western science and technology has created a highly consumptionist, uniform culture across the world — east, west, north and south — which instead of integrating the world's people is dividing them by increasing economic disparities, poverty and malnutrition. Vast quantities of natural resources are used to maintain the small minority benefiting from this process. The mismanagement of the world's resources engendered by this consumption is at the heart of the global environment and development crisis.

Intrinsic to this crisis is the twin destruction of biological and cultural diversity. The world's cultural diversity emerged from its biological diversity, as groups developed lifestyles suited to their immediate environment. Today, a variety of human groups, like the self-sustaining cultures of tribals, nomads and fisherfolk, are being destroyed and forced into marginalization with one dominant culture. In the last 30 years, at least one tribe is said to have become extinct every year.

This cultural uniformity is also resulting in a uniform physical environment, although many instances of this uniformity are inappropriate. Much has been written about the monocultures being spread by new agricultural and forestry practices and their ecological inappropriateness. But little has been said about the urban monocultures spreading across the world. Ancient cities in different parts of the world were very different from each other: each had developed around locally available resources, skills and climate. However, with each passing day, both the physical shape and cultural *milieu* of Bombay nudges closer to New York.

If human beings are to live in peace amongst themselves and with their environment, this process of multinationalization of culture will have to be stopped and an alternative process of development initiated.

Such a process must be egalitarian, with reduced disparities between rich and poor, and with power equally shared by men and women. It must be resource-sharing, participatory, and frugal — when compared to the current consumption patterns. It must respect the multiplicity of the world's cultures and lifestyles and aim at greater self-reliance at all levels of society: national, communal, and individual.

The current pattern of technological growth is such that it destroys community self-reliance and promotes insensitivity to environmental degradation. Probably the biggest change brought about by the industrial revolution is that the rich minority (both in the

developed and developing countries), which uses the bulk of the world's resources, no longer depends on the immediate environment to meet its basic needs. Beef and fruits come to the developed world from Latin America, peanuts from West Africa, coffee from East Africa, tea from India, shrimp from Asia and timber from all over the world. This has meant the appropriation of private lands and commons from the poor to meet the consumption of the rich. It has also become psychologically impossible for distant consumers to appreciate and become concerned about what their purchasing power is doing to these foreign lands. As rich consumers are no longer dependent on the immediate environment to meet their needs, they care less about what happens to it. Thus, we have a world economic system in which the individual has psychologically lost interest in the fate of his/her environment, immediate or distant.

Such a world order is clearly untenable. It is not surprising that the current environment and development crises are global and interrelated. The rich nations and the rich within these nations are trying their best to pass the ill effects of the current development process to the poor and less powerful. But poverty, unemployment, oppression and environmental degradation cannot go on indefinitely.

Unfortunately, current technological trends in microprocessors, biotechnologies, communications technologies, and ocean engineering technologies, indicate an even more incessant drive towards a multinationalization of culture, along with a further reduction of cultural and biological diversity and concentration of power amongst a few. The need for a rational, sustainable world was never greater. □

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Woodgatherers in Nepal: forced to destroy the very thing on which they depend.



# OIL UPON THE WATERS

## *Palm oil wastes in Malaysia*

ROWAN SHIRKIE  
AND S. CHING JI

Shortly after the palm oil mill began operations about 30 kilometres upstream, fisherman Ahmad bin Lahat was out of work.

Ahmad's livelihood was the freshwater Malaysian giant prawn, and before the palm oil mill began dumping its effluent into the Sungei Benut river near where he lived in southwest peninsular Malaysia, Ahmad and about 50 other fishermen prospered from the sales of their plentiful catch.

Palm oil effluent looks something like thin, grey soup. Like soup, it is served piping hot — as high as 80°C — by nearly 200 mills into waterways throughout Malaysia. Microorganisms in the water absorb the organic matter of palm oil wastes as nutrients, converting them to more stable compounds in a natural digestive process. This biodegradation requires oxygen, and the usual measure of the organic pollution potential in wastewater is its biological oxygen demand (BOD).

As Ahmad bin Lahat discovered, large amounts of organic pollutants can create an oxygen demand sufficient to choke off all life in the water into which they are discharged — including those oxygen-dependent microorganisms that normally biodegrade them. An average palm oil mill in Malaysia, for example, produces wastewater with a BOD equivalent to a city of about 145 000 people.

Oil palm is an important crop in Malaysia (and an increasingly important one in Thailand, Indonesia, the Philippines, Nigeria and Peru). The process to extract the oil, which is used for the manufacture of margarine and other edible products, requires large quantities of water for steam sterilizing the palm fruit bunches and clarifying the extracted oil. Large amounts of wastewaters are released, and most of the major river basins along the west coast of Malaysia are affected. In the late 1970s, a quarter of the mills were in designated "protected catchment areas" for water supplies for human consumption.

The waterways received not only the suspended and dissolved wastes, but also acidic phenol compounds. The result was a stink that discouraged people from using the water to drink, wash clothes or utensils, or bathe. Although the industry brought considerable prosperity to Malaysia, the wastes created considerable hardships for the rural people who had to draw their water or livelihoods from polluted streams and rivers. The problem extended to urban water supplies and even

into Singapore, which imported a major portion of its water supply from Malaysia.

### TIGHTENING STANDARDS

In 1977, the Government of Malaysia enacted legislation to regulate pollution from the palm oil industry. Until then, few palm oil factories had any means of controlling their waste discharges. Those that did simply passed their wastes through settling tanks — not a sufficient treatment. In a series of staggered reductions, palm oil effluent pollution was to move from an untreated BOD of between 20 000–30 000 mg/litre, to 250 mg/litre in five years. Other polluting components of the wastewaters were to be reduced accordingly. Existing mills were required to take remedial action, and before any new mill construction was permitted, the Malaysian Division of Environment had to be satisfied that effluent treatment was incorporated into the planning.

Many mills lacked the necessary technical capability to control wastewater discharges to meet the new

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### *How to preserve a valuable industry and conserve an equally valuable environment?*

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regulations, and the costs of conventional treatment plants were too high to be practical for most. To preserve a valuable industry and conserve an equally valuable environment, low-cost, effective treatment processes had to be found.

In 1977, the Asian Institute of Technology (AIT), based in Thailand, and the Division of Environment (DOE) of the Ministry of Science, Technology and Environment of Malaysia began a study to identify appropriate palm oil treatment technologies. In 1979, IDRC provided a grant that enabled researchers to assess the available technologies, and determine the most feasible for further development.

The industry itself had begun to innovate to meet the new standards. One of the larger groups, Guthries, was investigating using the raw effluent to irrigate palm oil plantations themselves. The high organic content, and particularly the potassium component, of the wastewater was found to complement fertilizers, thus saving up to CA\$100 per acre per year, Guthries estimates. Unfortunately, this disposal method requires that enough land suitable for irrigation lie close to the mill, and the high solids content, acidity, and concentrations of metals in the

effluent limit this use as well. Other processes, such as converting effluent to methane gas by fermentation, or drying it for use as an animal feed were investigated.

### SETTLING POLLUTION

The AIT/DOE study found that holding palm oil wastewaters in shallow treatment ponds for about 15–20 days could be an effective treatment. These stabilization ponds, as they are called, combine physical settling processes and bacterial action to reduce the BOD of wastewater by 95 percent or more — by levels well within the regulations. The type of pond researchers believe produces the best results relies on anaerobic bacteria — those bacteria that can grow in the absence of oxygen. Anaerobic bacteria exist in and near the bottom layers of a pond, where the heavier organic load of settled waste solids and the absence of oxygen provide a suitable environment. Some pretreatment of the wastewater by the addition of lime to neutralize acidity is required for best performance.

This single anaerobic pond system would be the cheapest to build initially, but would require continual outlays for the purchase of chemical liming agents. An alternative, involving recirculating part of the treated wastewater to dilute and neutralize incoming raw effluents and to charge it with active digesting microorganisms, was the most economical to operate and maintain. However, it was more expensive to build initially.

But as the study points out, treatment by either of these two methods "is economically feasible without imposing much stress on the part of the oil palm processors."

Statistics produced by an industry body, the Palm Oil Research Institute of Malaysia, suggest that effluents are now being drastically reduced in the wake of the new legislation and the adoption of treatment technologies. The Institute claims that prior to 1978, an estimated 222 tonnes of effluent were dumped daily into Malaysian waters. By last year, this had been slashed to 16 tonnes per day, according to the Institute.

Even with these claimed reductions, the DOE believes it will be 15 to 20 years before Malaysian rivers show any marked improvements. Palm oil wastes are only one of many pollutants contributing to the hardships of people like Ahmad bin Lahat. Deforestation and indiscriminate land clearing have produced serious silting problems. Coupled with polluting effluents from palm oil's big brother in Malaysia, the rubber industry, and human wastes from urban centres, these sources of pollution will require continued vigilance and innovative treatment methods to safeguard Malaysia's rivers for its people. □

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# ALTERNATIVES BEGIN TODAY

CARIBBEAN HOPES FOR DEVELOPMENT WITHOUT DESTRUCTION

STELLA DE FEFERBAUM

Photo: Mark Edwards/Earthscan



*Fishing in Haiti: industry and fragile marine ecosystems are crowded side by side.*

Cartagena of the Indies, pride of Colombia, the port city that was protected by the forts and walls of the Spanish crown during the colonial era, the unattainable object of the greed of the pirates of other days, again made history this spring. The signing of the Convention for the Protection and Development of the Sea Environment in the Region of the Wider Caribbean at Cartagena marks the beginning of a new era to "prevent, reduce and combat pollution... and to ensure a rational management of the environment."

Putting aside their differences, the 27 countries involved have joined, for the first time as a group, to act in favour of a common inheritance — the sea.

The area of the wider Caribbean is an enormous social, vegetal and animal mosaic. It encompasses 207 million human inhabitants in the states and territories with coastlines on this sea. The Bahamas, the Northeastern part of South America (from Colombia to French Guyana), Panama, Central America (with the exception of El Salvador), Mexico, and the United States (Texas, Mississippi, Louisiana, Alabama and Florida) form part of this mosaic.

Clearly, the region encompasses a wide political and economic diversity as well. But, as Colombian president Dr Belisario Betancur C. noted when he addressed the participants, "we must not allow either ideological or political problems to divide us." With the signing of the conventions, the Caribbean countries as a whole seem

decided to safeguard their common sea and are conscious of its vulnerability.

Although never as contaminated as the Baltic or the Mediterranean, the Caribbean already suffers from environmental problems that are beginning to affect its vulnerable peoples and economies.

Eighty percent of the waters of the wider Caribbean are more than 1800 metres deep, and half are more than 3600 metres deep. According to recent research there is little renewing of the deepest levels, and as a consequence, contaminants that reach those levels are not easily eliminated. Nor does the current knowledge of the fragility of the deep water systems of the Caribbean allow accurate calculation of its capacity to assimilate wastes.

Two of the longest and largest rivers of the world, the Mississippi and the Orinoco, flow into the Caribbean. These rivers, and in particular their sediments, are potential carriers of a considerable amount of contaminants. Data collected in 1974 indicated that less than 10 percent of wastewaters in the Caribbean went through treatment installations. It was also estimated that wastewaters generated by 30 million people were dumped into the sea without any prior treatment. The treatment plants for wastewaters in many vacation centres often cannot cope with the volumes of use. Maintenance is often inadequate.

The most serious concerns are the destruction of tropical forests; the disruption of the fragile ecosystems of

the islands, the coral reefs, swamps and mangrove forests, seagrass meadows and the spawning grounds for fish and shrimp; and the scarcity of drinking water and energy in parts of the region.

One of the greatest environmental dangers for the Caribbean is oil. The region is not only one of the most important oil-producing areas of the world, an enormous quantity of hydrocarbons is afloat on its waters: 4 700 000 barrels of oil per day, some in ships with a capacity of 200 000 tonnes. As many as 25 large oil tankers and 75 smaller ones may be crossing the Caribbean at any given time. In 1978, more than 76.5 million barrels of oil were discharged in the sea due to accidents, flushing of tanks or other operations. This quantity may increase in future. Meanwhile, the region has only developed a limited capacity for action in case of oil spills.

## DECLINE IN FISHING

The serious destruction of reefs and mangrove forests affects marine life, and at the same time the economy and well-being of the region. The coral reefs, for example, are a focus for primary production, supplying organic and energy-producing substances to the food chain of the ocean and contributing to the fishery resource. The mangrove forests protect the coastline from erosion and provide a haven to a great variety of marine life. These vital sources are threatened by polluting effluents of agriculture-based industries, such as sugar refineries or rum distilleries; the sedimentation produced by bad erosion from poor land use; and the wastewaters of the enormous tourist industry.

In some areas, sediments have already started to destroy the coral as far out as two kilometres into the sea. Those most hurt by this damage are the poorest — the coastal inhabitants who depend on the sea for their livelihood.

Nevertheless, development continues to be a challenge and a necessity for the countries of the Caribbean. The work that for over four years has been carried out by the United Nations Environment Programme (UNEP) and the Latin American Economic Committee (CEPAL), is trying to ease the road to an integrated and sustained development of the Caribbean, one that would be based on appropriate environmental practices and on the rational management of resources. The basic objective is to obtain a real improvement in the quality of life of the peoples of the region by means of "development without destruction," following the basic maxim of UNEP. Because as Colombian president Betancur pointed out, "the alternatives begin today, right now." □

*Stella de Feferbaum is regional liaison officer, IDRC Communications Division, in Bogota, Colombia.*



# THE WILD LARDER

CONSERVATION OF WILD SPECIES THROUGH BETTER USE IN AFRICA

YORO SARR

**A**frica is the continent most dependent on nature for its food supply. Studies on food production in Zaire show that 87 percent of the per capita yearly animal protein intake comes from hunting, fishing, or insect gathering. In the northern part of the Ivory Coast, some 27 grams of game per person per day are harvested. In Nigeria, hunting provides 20 percent of the animal protein consumed, while villagers in the Niger Delta daily consume the equivalent of 33 grams of fresh wild game.

These revealing statistics, presented during a wildlife management conference held last year at the Institute of Environmental Sciences at the University of Dakar, in Senegal, clearly illustrate the importance of improved game management in Africa.

Wildlife management is a natural outgrowth of environmental protection, asserted the conference participants. Such management is absolutely necessary in Africa, because hunger has caused desperate people there to lose the last traces of their ancestral reluctance to kill wildlife. Very often, the dilemma faced by the head of a family can be summed up as follows: "Do I have the right *not* to kill this elephant, if his tusks will guarantee the survival of my family for several weeks?"

These changes in traditional attitudes have been traced to colonization. Realizing the continent's great wildlife potential, early settlers brought in a series of measures that effectively made it their private preserve. But when all is forbidden, all is permitted. After independence, new authorities merely took responsibility for administering the same regulations, for their own benefit.

Consequently, Africa has many parks and reserves that do not form part of — and in some cases even harm — the local rural economy. The expansion of these parks has forced the abandonment of villages. The protected animals often attack domestic herds, and even humans, yet the villagers are not allowed to kill these predators. Moreover, since subsistence hunting in the pro-

tected areas is forbidden, game abounds: The national parks seem like veritable larders in the midst of hunger.

It is urgent that West African countries reconsider their attitude toward the environment, and develop wildlife management programs in co-operation with local populations. These programs might call into play three types of game management already applied in certain parts of the continent: cropping, ranching and farming.

Basically hunting, game cropping



*Ostrich in West Africa: every potential food resource must be used.*

has been practiced for a long time in a traditional form, with rites and taboos that ensure protection and sound management of the stocks. Indeed, the primitive African feared animals. Among the Dyolas in Senegal, burial of the lucky hunter was simulated so that he might escape the unpleasant consequences of his act. The Konkomba of Ghana apologized to game and, in the case of the antelope, acted as if they

had killed a man. Yet now, certain poachers do not hesitate to shoot at game wardens who dare to come between them and the elephants. In principle, a modernized hunt, open to a larger number of people, would represent the beginning of a management plan.

Game ranching requires that the animals be domesticated to a certain extent. This type of stock raising makes use of the resistance to disease, heat, and drought common to wild animals. And it is possible to take advantage of wildlife resources without damaging grazing land, since the wild animals use vegetation cover more efficiently than domesticated animals. On the Galana ranch, in Kenya, this approach has provided good results with the domestication of the oryx, African buffalo and Cape eland.

Finally, game farming refers to the raising of animals that lend themselves to domestication and tolerate being confined and fed hay or other feeds to supplement their regular food supply. The eland and buffalo, in particular, can be raised in this fashion to provide milk and draught power for agriculture. This concept can also be broadened to take in raising fish, birds, bees, and other species.

Goats, which are relatively prolific and resistant to drought, could also be rehabilitated, as new studies show that these animals are not the great culprits of desertification as claimed. The hides, milk and meat could bring extra income. Educating herdsman and teaching them to respect the capacity and limits of the land can prevent environmental damage.

Conference experts also favoured the raising of ostriches, particularly in Senegal: ostrich meat is very nourishing, the fat is used to treat rheumatism in traditional medicine, and artisans use the feathers and skin.

However, using the wild larder would involve a review of all the regulations covering waters, forests, parks, reserves, and fauna and flora in general.

To some, such ideas must seem utopian, or nothing more than the pipedreams of people who are nostalgic for an Africa that is inevitably bound to disappear. But if Africa is to achieve self-sufficiency in food, it may need every resource that can be used. □

*Yoro Sarr is a Senegalese journalist and a regular contributor to Afrique Nouvelle weekly.*





Photo: F. Botts/FAO

## CONSERVE AND PROSPER ENVIRONMENT IN THE '80s

LIBBY BASSETT

**E**leven years after the massive UN Conference on the Human Environment in Stockholm, Sweden, it appears that the environmental movement still has not gotten its message across.

Simply put, that message is: all human economic and social stability rests on one base, the earth's natural resources. Destroy them, and the foundation for all life on earth is destroyed.

The real tragedy of the environment movement is that for all its successes over the past decade or so — and there have been many — it has not yet laid to rest the myth that environment and development necessarily conflict with one another. It is still widely held that the environment can be protected only at the expense of economic progress.

There is a curious anomaly here. Over the past decade there has been enormous growth worldwide in both environmental awareness and the number of organizations attempting to deal with environmental issues. A survey by the World Environment Center found a massive increase in global environmental concern, evident in the fact that 144 countries now have environment and natural resource management agencies. This is six times as many as there were just 10 years ago.

In Third World countries alone, the number of agencies stands at 105, up from 11 at the time of the UN Conference on the Human Environment in 1972.

*(Above) Planting a tree seedling at an experimental station in northern Tunisia. Economic development is nurtured, not hindered, by environmental conservation.*

Of the industrialized countries at that conference, only 15 then had environment agencies.

But as the 1980s began, and as the world economy went into a tailspin, many governments — particularly Third World governments — felt compelled to focus their decreasing financial resources on more immediate economic and political goals.

The declining demand for exports of raw materials from developing countries is now reflected in their inability to service their growing indebtedness. The spectre of these countries defaulting on their debts has shaken many of the world's major banks — and the industrialized countries that rely on "free trade."

### RESOURCE FAILURE

The executive director of the UN Environment Programme, Mostafa Tolba, said a year ago in Berlin that the rich nations "are turning their disadvantaged trading partners into proxy victims. And be in no doubt, their economic collapse will drag the devel-

oped nations into the abyss with them."

Tolba's belief is that the only path to permanent economic recovery lies in the overturn of the global economic system which, he said, is not only grossly unfair to developing countries, but also erodes their resource base.

"Throughout the world," Tolba said, "there is copious evidence of the carrying capacity of systems being overloaded to breaking point. Where life-support systems have already collapsed, the options for the poor are stark: either to flee or stay put and starve."

He cited as examples Haiti, now almost completely deforested and barren, and the Sahel region of northern Africa, where desertification has led to prolonged, deadly drought. People have been forced out of these areas to join the growing legions of "environmental refugees."

Tropical forests, he also pointed out, are now disappearing at the rate of one hectare every 2 1/2 seconds. Environmental diseases, such as malaria and bilharzia, are now more widespread than ever due to ill-planned development and the failure of authorities to provide their people with clean water and decent sanitation. And, Tolba said, billions of tonnes of irreplaceable topsoil are blown away each year, with 20 million hectares of productive land degraded annually "to a state of complete uselessness."



This last is not just a Third World worry. The industrialized nations' forum, the OECD, warned last year against the dangers of the current practices of converting farmland to nonagricultural uses and allowing soil to be degraded: "Within 20 years more than one-third of the world's arable land could be lost or destroyed." And this loss would take place during a period in which the earth's population is expected to grow by two billion.

Because soil conservation is essential if the world is to feed the next generations, the UN Environment Programme, along with other UN agencies, developed a "World Soils Policy." Last year Tolba sent this document to all UNEP member governments asking for their comments. Not one responded.

Perhaps one reason for this failure is that it is only comparatively recently that environmental issues have become critical. So much of what afflicts us today has happened in just two or three generations, a mere blip in human history.

The Director of the World Bank's Office of Environmental Affairs, Dr James A. Lee, warned recently: "If the development community perceives no need to pursue patterns of development that give promise of being sustainable, no need to reorder priorities concerning the exploitation and consumption of the supporting environmental and resources substratum, it will do so at its own great risk and peril. Failure of our global environmental system means failure of our global economic system."

#### RISK ASSESSMENT

During the past few years, a number of people and organizations have outlined what they consider our great environmental, and consequently economic, risks.

The threat of nuclear war perhaps tops the list. As Audubon Society president Russell Peterson said at the International Public Hearing on the Environment in London, England, last year, "In comparison, every other threat to the environment pales into insignificance." Not only would a nuclear war kill hundreds of millions of people, but it would drastically alter the earth's air, soil, and water — and any surviving plant and animal life.

The second greatest threat is probably population growth. Most of the next two billion people will be born in Third World countries, many of which already have problems supporting their current populations. This means that most of the people born in this next generation will be born very poor. As Dr Lee of the World Bank said recently, "... Soon, over 75 percent of the six billion inhabitants will swell the ranks of the poverty-stricken and intensify pressures on already severely degraded environments." As long as people have to struggle to survive, they will be forced to damage the very resources on which the improvement of their lives depends. They deplete

their biological "capital," clearing forests for fuelwood and to grow food, even if eventually the wood, land, and water they need are destroyed.

A fourth environmental threat is the production and use of energy. Nearly half of humanity relies on wood to cook food every day, and for many people it is also the only source of warmth. Deforestation causes erosion, damages watersheds, and destroys countless species. The burning of fossil fuels — wood, coal, and oil — releases carbon dioxide, which may have serious impacts on world climates. Energy mining and drilling can damage the land and the oceans. Automobile and electric power plant emissions can cause acid rain. Oil spills foul coasts and kill marine life. Nuclear plants stockpile dangerous radioactive waste in the hope that a totally safe storage method will eventually be devised. And these same nuclear plants help accelerate the proliferation of nuclear weapons.

Another increasingly serious environmental risk is toxic chemicals. Modern science has created tens of thou-

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*We  
jeopardize the future  
by ignoring  
the fact that  
the environment  
is the foundation  
of all  
economic development*

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sands of new compounds, many highly toxic and not readily recycled by nature. Some countries have passed laws to control toxic chemicals, but less has been done to enforce the laws or to come up with international standards for the production, transport, trade and disposal of the chemicals.

#### ACTION AND WILL

During the past few years, studies and strategies have proliferated. The problems have been examined and calls-for-action made. There have been some notable successes: nine of the world's biggest development agencies and banks (including the World Bank, the UN Development Program, and the Asian, African, Caribbean, and Arab development banks) three years ago signed a common Declaration of Environmental Policies and Practices, in which they agreed to incorporate environmental considerations into all their development projects. Bilateral development organizations are moving in that direction, spurred on, in part, by the fate of the U.S. Agency for International Development — it was suc-

cessfully sued by four environment groups and now by law must make environmental assessments of all its development projects.

The UN Environment Programme has, over the years, provided useful data through its Global Environmental Monitoring Systems (GEMS). And it has managed to bring together politically disparate countries to cooperate on its Regional Seas Programs, which now operate in 10 marine regions. However, the fragility of these agreements was shown this year when Persian Gulf nations were frustrated in attempts to stop an oil spill caused by the war between Iran and Iraq.

About 150 international treaties deal with environmental matters. What is necessary is to institute a procedure to urge governments to implement them. Some treaties, according to Manfred Lachs, a judge at the International Court of Justice in the Hague, may need revision and amendment. And others are urgently needed to cover such issues as the uncontrolled export of valuable primary resources, such as tropical woods, and the detrimental export of poisonous chemicals to developing countries.

Judge Lachs makes a point that all concerned with these issues eventually admit: there will never be the political will to confront and resolve these complicated, yet life-threatening, problems until people understand them. Only then will they mobilize and demand action.

This kind of environmental enlightenment and popular call-to-action is not just the province of the comfortably well-off. In Malaysia recently, a nationwide petition and publicity campaign mounted by environmental groups saved their only national park, Taman Negara, from a massive hydroelectric project that would have irreparably harmed it. Last year, environmental groups from around the world met to found the Pesticide Action Network to halt the indiscriminate sale and misuse of hazardous chemical pesticides. The signing of the Cartagena Convention for the protection of the sea environment (see story page 8) by the nations bounding the Caribbean is another hopeful sign.

If people are aware, they will act, and their leaders will have to react. Until government leaders see the environment for what it is — the foundation of all economic development — they will continue to treat threats to the environment, which are comparatively long-term, as less important than more immediately perceived threats. This habit was perhaps best exemplified by a remark Britain's Prime Minister Margaret Thatcher made during the Falklands war: "When you've spent half your political life dealing with humdrum issues like the environment..., it's exciting to have a real crisis on your hands." □

Libby Bassett is editor of World Environment Report.





# DANGER:

## DEVELOPMENT AT WORK

*Occupational health problems begin to trouble developing countries*

ZULF M. KHALFAN

**I**n the rush toward industrial and agricultural development, developing countries are paying an increasingly unacceptable price in terms of human suffering and sickness due to occupational hazards.

The International Labour Organization (ILO) estimates that there are 50 million work-related accidents every year — 160 000 every day — many of which result in permanent disability. And although the accident frequency rate in industrialized countries has leveled out, the rate of fatal accidents in developing countries has doubled and even tripled. The increase, ILO says, is largely attributable to "the negative or adverse effects of transfer of technology."

In the past, safety in the workplace may have been neglected as priority was given to economic and production goals. Workers themselves were more concerned with getting better wages or keeping jobs than they were with protecting their health. Now policymakers have become aware of the need to conserve skilled workers and to reduce the financial losses caused by occupational hazards. The ILO has estimated that economic losses due to accidents and occupational

diseases run as high as 5 percent of GNP in some countries.

At the 10th World Congress on Prevention of Occupational Accidents and Diseases, held recently in Ottawa-Hull, Canada, the theme "new horizons in occupational safety and health" was well supported by over 100 papers presented by some of the 1505 participants from 85 countries. But, the impression given by some of the nearly 100 representatives from 40 developing countries was that for the Third World, those "new horizons" are clouded yet.

Developing country health and labour representatives felt that occupational health matters are accorded a low priority by Third World decision-makers. Their countries have very limited resources, and primary health care services are already over-burdened with preventing or curing endemic diseases. As their countries become more industrialized, decision-makers need more information, which is today scanty. So decision-makers, employers, workers and trade unionists are all insufficiently informed about occupational safety and health matters.

The Third World situation is

characterized by a lack of an "industrial tradition" or "culture," while it also has a high illiteracy rate. About 80 percent of the Third World's people are rural based, engaged in agriculture, and poorly educated. Many of them, from different tribes and customs, migrate to the urban industries. A conference paper presented by Rafael Ramirez of the Faculty of Environmental Studies of York University (Toronto, Canada) points out that in general, lack of education forces them towards the bottom of the job spectrum. Illiterates are therefore over-represented in dangerous jobs.

In the developed countries, about 10 percent of the population is engaged in manufacturing industries. Only about 4 percent of the population in developing countries is engaged in industry. Though the industrial workforce of developed countries seems to have stabilized, there is an increasing growth of about 4 percent a year in the industrial workforce of developing countries.

As more people join industries, the rate of accidents increases. On an average, some 160 000 job-related accidents occur daily around the world. Many others are unreported and unrecorded. The rate of





*Development brings a range of occupational hazards to workers in the Third World: exposure to chemicals, such as pesticides (above, left), poorly guarded machinery (centre), and lack of protective equipment (right, a foundry worker).*

accidents in individual developing states, says ILO, is about five times higher than in some individual industrialized states. The average rate of fatal accidents revealed in a 1980 survey of nine developing countries was 0.31 per 1000 workers per year, whereas that of nine industrialized states sampled was 0.06 per 1000 workers a year. Can developing countries afford this cost of industrialization?

As Morrison Mpmugo, a Nigerian trade unionist, said: "A healthy worker is an asset to the company and the production process, but we find the employers reluctant to spend on the improvement of occupational health conditions and measures for the workers. As a result, they are paying heavily in other expenses." ILO estimates the invisible or hidden cost in material and productivity lost is often higher by a factor of four to six times the direct cost of medical treatment and compensation to injured workers.

#### IMPORTANT HAZARDS

Pressed by a growing need for rapid industrialization, the Third World now finds itself importing hazards along with modern technology. In 1979, developing countries imported 27.1 percent of

the world's machinery and transport equipment. They were also susceptible to all the hazards that came with them, as the mere "translocation" of machinery and equipment as "transfer of technology" can cause disaster. The design of equipment and machinery has to conform to the anthropometric factors, or the particular characteristics of the people for whom they are intended. Adequate attention is sometimes not paid to social and climatic factors, local levels of skill and training, ability to maintain the equipment, or anthropometric factors, notes David H. Brown of ILO. An imported technology might affect the working environment adversely, cause accidents, increase workload beyond the nutritional capability of the workers, or produce other negative effects.

For developing countries, there is also often a costly time lag between acquiring new technology and obtaining modifications or innovations that follow their introduction. Frequently, because of the extra cost, new improvements needed never actually reach them, or are by-passed.

Many industrial enterprises in developing countries are run by multinationals as "turnkey" projects, says Dr S.S. Ramaswamy, Director-General of the Central Labour Institute (CLI) of India's Ministry of Labour and Rehabilitation. Yet, to prevent hazards, the technology should be suited to the special needs and conditions of the recipient country. Workers need extensive training to operate and maintain new technology. About 18 percent of reported accidents in industry in the Third World are due to faulty or unguarded machinery.

The obvious accidents occur as fatalities, loss of organs, fingers or eyes. Invisible harms such as lung damage or disease from inhaling toxic chemicals or industrial dust are not noticed at their onset.

In India, one of the major industries with glaring occupational hazards is the textile industry. It employs nearly 1.5 million workers all over the country, of whom over 800 000 are in cotton textiles alone, according to a report of the Centre for Science and Environment in New Delhi. The problem has attracted research efforts by the CLI and Bombay University's Department of Chemical Technology.

A major occupation illness affecting textile workers is byssinosis, a disabling respiratory disorder caused by inhalation of cotton dust over several years. Workers in the dustier departments of the textile mills such as the bale opening room, the card room, the blow room, and the winding and spinning rooms show a higher incidence of byssinosis (popularly

known as "brown lung"). In its advanced stage it results in "breathlessness on all days because of reduced breathing capacity leading to permanent incapacity" (that is, in death), according to Dr Harwant Singh of the CLI. Dr Singh says that one in five cotton operatives probably has the disease in some stage of development.

Besides the ubiquitous cotton dust, there are also serious chemical hazards involved in the extensive use of dyes and chemicals in textile mills. For example, inhalation of sulphur dioxide, sulphur trioxide, carbon disulphide, and other chemicals used in the industry has been shown to increase the incidence of coronary diseases; it also brings about changes in blood chemistry and reduces the brain's ability to exert control over muscle movement. Excessive exposures can lead to death.

On an average working day in India, seven to eight workers die, and over 5000 are injured seriously enough to lose three or more days from work.

In the Mahatma Gandhi Memorial hospital, located in the heart of industrial Bombay, approximately 19 000 workers (and their family members) were hospitalized over the year 1979 for a variety of complaints ranging from TB, byssinosis, cancer and heart disease, to accident injuries. The hospital's death register records an average of 30 deaths a month. The MGM hospital is only one of the seven Employees State Insurance Scheme (ESIS) hospitals in the city.

In many cases, accidents or extreme exposure to noise, toxic chemicals and gases result in acute, easily identified illnesses. But most workers are exposed to low levels of these hazards which may be just as deadly in the long run, though less apparent in the short run.

Low-level hazards cause chronic illnesses whose onset is often not noticed. The illnesses themselves, such as lung cancer and heart disease, are generally attributed by industry and the medical profession to nonoccupational causes. They, therefore, go unrecognized, uncounted and uncompensated.

#### CHEMICAL THREATS

The World Health Organization (WHO) finds the number of toxic chemicals produced and handled by workers is increasing rapidly. Dyes, pesticides, detergents, pharmaceuticals, flavour essences, preservatives, plastics, and others have increased health risks to both producer and consumer alike.

Dr Jan Sedlak, acting chief of ILO's Occupational Safety and Health Branch, says that the number of new chemicals entering the market yearly (produced in excess of one tonne) is estimated to range between 200 and



1000. In many cases, their toxic properties are unknown in advance. What is more, ILO estimates that, based on existing toxicological methods, it will take some 80 years to assess the toxic properties of about 40 000 untested new chemicals.

The Third World today is a major importer of these chemicals: importing nearly 25 percent of the world's chemical production, according to the latest available UN statistics.

Because the majority of workers in developing countries are still agricultural workers, one family of chemicals in particular poses what may be the most pervasive occupational hazard of all in developing countries — pesticides.

Pesticides have overtaken endemic diseases as a cause of death in some countries, says Dr Wai-On Phoon of Singapore University. In 1972, a WHO Expert Committee on Insecticides estimated there were about 500 000 cases

of accidental pesticide poisoning annually. About two percent of these resulted in death, mostly in areas where there was scarce medical service. The Third World accounted for half of these poisoning cases, and about 6700 deaths or 72.8 percent of the total deaths. Many more such poisonings go unreported.

In a book entitled *A growing problem*, published by OXFAM, author David Bull gives an account of the magnitude of pesticide hazards in the Third World. Since 1972, writes Bull, the growth of pesticide market is estimated at 5 percent yearly. At that rate, it is estimated to have increased by 50 percent by 1980–81. He calculates that pesticide poisoning cases are assumed to have increased at the same rate; by 1981 there was probably an annual rate of 750 000 poisonings resulting in 13 800 deaths. And of those, there were probably 375 000 cases in the Third World, with some 10 000 deaths

a year — an estimate Bull considers to be based on an initial conservative figure.

Yet hard statistics on the Third World's incidence of pesticide poisoning are limited. Only when major incidents occur are reliable statistics obtained.

Similarly, in the Third World, figures do not generally include long-term effects, such as cancer, sterility, birth defects, and debilitation in general. They tend to refer to acute poisoning, where death or sickness occurs rapidly after exposure over a short period.

A 1979 Sri Lankan study quoted by Bull gives a national average of 104.5 cases per 100 000 of population, considered "probably the highest in the world."

In 1977, pesticide deaths in Sri Lanka numbered 938, compared to 646 deaths due to malaria, tetanus (with 604 deaths, the highest in the group), diphtheria, whooping cough,

## LIVING AND WORKING IN HEALTH

Occupational health problems in developing countries cannot be separated from the harsh living conditions facing workers.

Mr Jaime Sepulveda, the Deputy Director of Health Programs of the Central American Confederation of Universities (CSUCA), told the 10th World Congress on the Prevention of Occupational Accidents and Diseases held this May in Ottawa that workers' living conditions contribute to their health problems on the job.

"In Central America, life expectancy is 49 years. Why? Because farm workers are harshly used, doing piece work on the plantations. The hours are long — they work 12 hours nonstop except for a half hour break for lunch. During the harvest season, which lasts four to five months, overwork coupled with undernourishment and poor general health, cause accidents. In the small industries sector, the situation is similar."

Central American workers have always borne the brunt of economic and political problems as unemployment and lower wages bring with them the "inevitable social pathologies," such as alcoholism and prostitution, said Mr Sepulveda in a later interview with *Reports*.

It is difficult for workers in the Third World to mobilize to address the issue of occupational health. For instance, three-quarters of the workers are employed by small businesses and have no unions. And even when collective action is possible, changes are hardwon.

"In El Salvador," said Mr Sepulveda, "it took a three-month strike in

1980 to secure improvement in health-related working conditions in the cotton sector of the southern part of the country."

The Director of Occupational Health Branch of the Department of Health in Sudan, Dr Yousaf Osman, agreed with this assessment.

"All gains towards improving the health and hygiene of working conditions were the result of labour unions fighting for concessions. Governments only served as referees between employers, who equate such measures with wasting money, and labour unions, which are trying to protect the health of their members. A certain balance is struck. But where workers have not been able to get together and fight

vigorously, no real progress has taken place."

Government policies in many developing countries are aimed at ensuring economic growth through rapid industrialization. But this ambition for progress is jeopardized from the very beginning by the poor state of the population's health, which cannot support such efforts. Programs of health care and disease prevention therefore must be integrated with the overall medical services provided, Dr Osman said. Occupational medicine should not be seen as being separate from the other health services.

Jacques Dupont



Working the sugarcane fields in Costa Rica: poor general health causes accidents.



and poliomyelitis combined.

## COMPOUNDING PROBLEMS

Illiteracy, malnutrition, poor equipment, lack of personal protectives, and lack of assimilable information aggravate the Third World situation. The inadequacy of labour legislation, coupled with a shortage of adequately trained personnel to enforce what regulations exist has contributed to the neglect of health and safety in the workplace.

During the month of January 1981, the staff doctor of a wet-cell battery manufacturing company located close to Bangkok, Thailand, treated 303 respiratory complaints; 117 eye, ear, nose and throat infections; 71 gastrointestinal disorders; and 32 cases of skin irritations. Six of the company's 400 workers were hospitalized for lead poisoning.

And yet this firm boasts better-than-average working conditions. There is a full-time physician and a small dis-

pensary. Accidents are relatively few.

Asbestos fibres cause pneumocosis, dust in lungs, known as asbestosis. It creates carcinoma of the lungs, a high risk occupational hazard to asbestos miners, or those engaged in cutting, brushing, or filing it.

Though the production of asbestos has been banned in some advanced countries, asbestos manufacturing enterprises have been exported to developing countries. And asbestos products, such as tiles, drain pipes, and roofing sheets, are more common in the Third World.

Mineral dust diseases, (silicosis), are common among iron and coal miners, potters, masons, quarry workers, and brickmakers. Aerosol gases, vapours, fumes, or vegetable dusts affect lungs too. Sugarcane refinery workers may get pulmonary fibrosis — bagassosis — from mouldy bagasse, affecting the thin air passages in the lungs.

The list is almost endless, and the

question is whether the Third World can afford the cost in human and material terms. It is a complex problem generally, putting a heavy responsibility on these countries to create safety standards, and to be discriminating in their imports; and, on occupational health specialists and unionists, to step up awareness among employers, workers, and the public on hazardous industries. Solutions will not be simple, nor quick. The more industrialized states themselves, have only recently discovered hazardous inclusions or omissions in technology and are constantly innovating to avoid them.

The least the Third World can do is to stimulate a dynamic concern at all levels and try to avoid repeating mistakes of developed countries as they approach the "new horizons." □

*Zulf M. Khalfan is a freelance Ugandan journalist who writes on Third World topics. He is based in Ottawa, Canada.*

## RESEARCHING FOR SAFETY

Developing countries increasingly recognize the need to protect industrial workers from the hazards of the workplace. But when governments try to tackle the problem, they find there is little information about the nature and extent of occupational injuries and diseases.

Researchers in the Third World have begun recently to collect statistics on working conditions in industries, on related safety and health problems and on the existing health services. IDRC has funded a number of these studies in Southeast Asia, Africa and Central America to provide decision-makers with the data necessary to plan protection.

● In Southeast Asia the Asian Association of Occupational Health (AAOH) is carrying out extensive studies of occupational health conditions and facilities in seven countries — Korea, Indonesia, Sri Lanka, Malaysia, Thailand, the Philippines and Singapore.

The experience of developed countries is not always applicable to Asia, so the studies will focus on the problems distinctive to the area. An inventory is being compiled of occupational health problems in the work force. Also underway is a study of pesticide poisoning in agricultural workers — traditionally the sector employing the largest segment of the population. A final AAOH project supported by IDRC is a study of environmental and health conditions related to the handling of metals and lead in the small-scale industries typical of Asia.

● Workers in textile mills in Indo-

**I**f little  
is known  
about occupational hazards,  
little  
can be done  
to eliminate them

nesia and Hong Kong are exposed to the same health hazard facing flour mill and mine workers in Sudan and Tunisia — pulmonary diseases caused by the inhalation of dust particles.

The faculty of Medicine at the University of Indonesia is gathering information about "brown lung" or byssinosis associated with the cotton dust to which textile workers are exposed. Initial studies have indicated that as many as 40 percent of the 130 000 textile workers in Jakarta may have byssinosis, so remedial action is essential to eliminate the disease.

A similar study to estimate the extent of lung diseases in textile workers in Hong Kong should also provide useful information for program planning.

In the Sudan, the Ministry of Health is assessing working conditions for miners who suffer from silicosis caused by silica dust and for flour mill workers who experience respiratory disorders from exposure to flour dust. Once the link between conditions and lung diseases has been established, the researchers will recommend preventive measures.

The many lead, zinc, iron and phosphate mines in Tunisia mean that workers there are exposed to the risk of silicosis as well. A study similar to that

in Sudan has been undertaken to examine the problem and possible solutions.

● The lack of information regarding health hazards in the workplace is not restricted to either industrial workers or to Asia. The introduction of agricultural technologies, mechanization, pesticides and herbicides has meant an increasing rate of accidents and illnesses for agricultural workers in Honduras as in the rest of the Third World.

Banana cultivation is a major economic activity in Honduras, employing about 63 000 people. The majority is employed by several large, foreign-owned plantations, and workers are subjected to a number of health hazards they would not experience on smaller, independent farms. The problem is made worse by illiteracy and malnutrition.

A research team from the Universidad Nacional Autonoma de Honduras is studying company records of work-related accidents and illnesses from 1976 to 1980 among the 6000 banana workers of the United Fruit Company.

Once these studies are completed, planners will have a much better idea of the relationship between the work environment and job-related health problems in developing countries. The next step will be to implement regulations, preventive measures, and educational campaigns that will make owners and workers alike aware that industrial development can take place without increasing occupational accidents and diseases.

*Andrew Williams*



# THE NARCOTICS TRADE

TIME FOR A DEVELOPMENT PERSPECTIVE?

ANDRÉ McNICOLL

**E**ver since the Shanghai Commission met in 1909 to find ways to curb the opium trade, the narcotics problem has been seen as originating in the impoverished nations of the world. As a consequence, it has been fashionable in the North to see narcotics trafficking as a law enforcement problem calling for ever-more punitive measures against the producers. What has been forgotten — conveniently so for the North, which is incapable of dealing with the demand-side of the drug equation — is that the present pattern of the drug trade is the result of a colonial

imprint, and the North's own "progressive" pharmaceutical industry.

Arab traders had probably introduced opium into China around the 8th century when they established commercial ties with merchants in the port of Canton. The Chinese were quick to recognize the seriousness of opium addiction, but their chief supplier was the British colony of India. Chinese control measures then, were doomed by the interests of the Empire.

The first Opium War of 1839, declared by the British, who



Photo: Don Meeks/Addiction Research Foundation



were exceedingly annoyed with persistent Chinese efforts to prohibit opium, resulted in the island of Hong Kong being ceded to the “barbarians” — as China so quaintly referred to its European tormentors. The British colony of Hong Kong encouraged opium smugglers to operate out of its harbour and established itself as the world’s key opium distribution centre. Incredibly, opium importation, distribution, and use were not banned in Hong Kong until 1945.

A second Opium War broke out in 1856 after the Chinese had refused to yield to British pressure to legalize opium and permit access to more inland ports. The Treaty of Tientsing, signed in 1858, opened up 11 more ports to Western powers and legalized the importation of opium. By 1880, Chinese imports of opium were more than 6500 tonnes a year — almost all of it from India — and its addict population was estimated in excess of 15 million.

#### OTHER COLONIAL CULPRITS

The three countries of Southeast Asia that make up the so-called Golden Triangle are Thailand, Burma, and Laos. Burma, a former British colony, produced large quantities of opium for export to China — despite the vehement protestations of successive Burmese kings. In more recent times, insurgency and activities of the remnants of the Chinese Nationalist Army, the Kuomintang, maintain the high levels of production to gain revenues to buy arms.

The recent pattern of the opium trade in Laos is largely the result of the many years of political struggle and intrigues in Indochina after World War II. With France’s covert, if not overt, support, French-Corsican syndicates were firmly established as the chief exporters of Laotian heroin to Europe until they were broken up in the 1970’s. Still more recently, the American Central Intelligence Agency (CIA) supported the drug trade of the hill tribes to try to contain communist Pathet Lao activism.

In Thailand, following the recommendation of British advisor Sir Malcolm Delevingne, in 1934, licit opium cultivation was promoted in the highlands. After World War II, Thailand experienced difficulty in obtaining opium for its registered addicts, and had to authorize more poppy cultivation. Eventually, with the elimination of smuggling from Yunnan Province in southern China and from Iran, Thailand emerged as a significant opium producer.

#### THE PRODUCERS

Opium can only be produced when and where labour is cheap and abundant. Anywhere from 175 to 250 hours of labour are required for every kilogram of the drug, and the size of the poppy plot is restricted to the number of plants that can be incised and then scraped of raw opium resin within a 24-hour period. In most of the producing countries — such as Turkey, Iran, Afghanistan, Pakistan, India, and Mexico — plots rarely exceed 0.5 hectares. Opium cultivation represents only a small amount of the farmer’s total cropped land; the rest serves to grow food crops. In Southeast Asia, however, because of political and historical factors that have made opium cultivation an integral part of the life of the hill tribes, opium fields tend to be larger and may represent as much as half of the cultivator’s cropped land.

Opium use is widespread among the hill tribes of the Golden Triangle: to treat the symptoms of gastrointestinal diseases, as a painkiller, and for recreation. As a form of currency, it is exchanged for salt, rice, and other commodities provided by local Chinese traders.

Opium growers employ the “slash and burn” agriculture technique. In Thailand, they are often accused of destroying the watersheds of the major rivers on which the country depends for a good part of its lowland agriculture. The extent of the environmental damage is a matter of conjecture and of considerable dispute. The forest areas cleared for opium growing are usually between 900 and 1500 square metres. They are sparse, and their water retention

capacity may be limited. It is also noteworthy that hill tribes who follow similar practices, but for other crops, have escaped criticism.

In Thailand, there are approximately 6000 hectares under poppy cultivation. It is difficult to estimate the resulting average annual income because of the surreptitious nature of the activity and wide and frequent fluctuations in prices. On a regional and national basis for 1981, if a maximum production of 100 tonnes for Thailand and 600 tonnes for the Golden Triangle, and a price of CA\$54 per kilogram is assumed, this would mean total “farmgate” revenue of CA\$5.5 million for Thailand, and CA\$33 million for the three countries. However, since 50 percent of production is consumed regionally, only half of these figures would represent foreign earnings. International agencies usually depict the growers as the “poorest of the poor,” members of oppressed ethnic minorities eking out a marginal existence. This tableau may be only partially correct. The fact is that opium farmers in Thailand have incomes well in excess of the Thai average, and several times higher than that of other farmers. To replace opium with rice as the market crop, and maintain the same income level, would necessitate more than doubling the rice harvest. This would create insurmountable problems of labour shortages and accelerated soil depletion.

#### THE GOLDEN CRESCENT

The opium-producing area referred to as Southwest Asia, or the Golden Crescent, comprises Iran, Afghanistan, and Pakistan. The political upheavals in Iran and Afghanistan make it almost impossible to assess the current situation there, and the picture in Pakistan has changed very considerably in recent years. Opium cultivation there is concentrated in the Northwest Frontier Province, an area largely under tribal control where large tracts of land seem ill-suited to the cultivation of anything else but opium. Annual illicit production in the mid-1970’s was estimated at approximately 150–200 tonnes, but by the end of the decade may have been as high as 800 tonnes. In 1971, prices paid to farmers in Southwest Asia ranged from CA\$12 to CA\$39 per kilogram. More recent information indicates that prices have risen significantly, but that the proportion paid to the farmer has not changed.

#### THE COCAINE TRADE

Estimated world licit needs for processed coca for pharmaceutical use in 1981 were 1441 kilograms, and for coca leaf 8 493 349 kilograms. But there is now staggering overproduction of coca leaf, principally in Bolivia, Peru, and Colombia. Total production for the three countries could be as high as 100 million kilograms.

The mature coca bush is marvellously adapted to the Andean region and the socioeconomic conditions of the native peoples. The bush will produce harvestable leaves over a period of 15–30 years, and it has an elaborate and deep root system that greatly reduces soil erosion. It is labour-intensive — but only for a short period of time — and is suited to the family as a unit of production. Yields are almost always reliable: it is not particularly sensitive to variations in rainfall and soil conditions. While no comparative figures are available, coca is always reported as the best cash crop for growers — more lucrative than coffee, bananas, pineapple, cassava, or any citrus crop. The market is steady, so much so that coca leaves are used as a form of currency at a fixed rate of exchange in stores and other trade and barter situations. Coca use is extremely widespread throughout the Andean region, as a folk medicine and for recreation.

Coca cultivation has become an essential component of the Bolivian economy, and has led to land speculation. It has also led to rural unemployment for those farm families not inclined to this type of farming activity. In Colombia, trafficking has resulted in marked disparities in the distribution of income within regions; it has contributed to an increase in the prices of virtually all goods and services, and, at the same time, decreased the production of necessary goods and services. The massive flow of trafficking dollars — estimated at about CA\$190 million annually — has distorted Colombia’s economic picture and is believed to be a

*(Opposite) Harvesting opium in the Golden Triangle: the international trade in narcotics was just as much the creation of a dependency among nations as among drug users.*



major factor in the government's inability to control inflation.

#### THE CANNABIS TRADE

In terms of volume, monetary value, and complexity of operations, cannabis has become one of the most important trade commodities in the world. The principal countries from which marijuana is supplied to the U.S.A. are Colombia, Mexico, and Jamaica. The retail value of these marijuana imports for 1979 would have been roughly CA\$17-\$25 billion. In addition, some 200 tonnes of hashish worth CA\$835-\$885 million retail were imported, principally from Morocco, Lebanon, Afghanistan, and Pakistan.

It is difficult to gauge current cannabis production in Colombia and consequently, its monetary value. Drug officials in the U.S.A. have given a high intelligence priority to verifying the results of a 1978 aerial survey of marijuana cultivation in the northeastern Guajira Peninsula, which estimated that 70 000 hectares of cannabis were under cultivation with a possible annual yield of 100 000 to 200 000 tonnes. Colombian analysts maintain that less than 3 percent of the total monetary value of the crop remains within Colombian hands. But this percentage still means from CA\$530 to \$930 million was pumped into the country's illicit agricultural sector.

#### JAMAICA

Cannabis has been described as Jamaica's main cash crop and most important single source of foreign currency. With the possible exception

of Colombia, there is probably no other country in the world whose economy is so enmeshed in the narcotics trade. In 1980, the island exported (excluding tobacco) CA\$205 million of agricultural produce, considerably less than the retail value of its cannabis trade.

Cannabis production for export is now approximately 4800 tonnes, worth about CA\$1.25 billion in retail value. About CA\$245 million of this remains within Jamaica, making cannabis still more important economically than bauxite mining, tourism, and agricultural exports.

In Jamaica, the cultivation of cannabis is a poor man's enterprise and it fits well into the island's pattern of mixed cropping. For the great majority of growers it is an agricultural sideline bringing in critically needed income.

The use of marijuana in Jamaica is extraordinarily widespread, and has been labelled as "one of the highest rates for any nondeviant population in the Western world."

Increased cannabis cultivation is likely to occur in other developing countries in the future, particularly where previously there has been little or no cultivation.

This is precisely what is happening, for instance, in the coastal regions of the Niayes and the swampy areas of the Casamance in the south of Senegal. With two harvests a year and a kilogram of cannabis ("yamba") selling at CA\$22-\$29, profits are considerably more attractive than a kilogram of groundnuts selling for CA\$0.30.

Both cocaine and cannabis pene-

trated the North through popular patent medicines. Cocaine was guaranteed to cure shyness, headaches, and neurasthenia. Cannabis (which includes marijuana, hashish, and hashish "oil") was hailed as a remedy for physical pain, muscular spasms, convulsions, tetanus, rheumatism, and epilepsy.

Each great pharmaceutical leap in modern times has resulted in a serious drug abuse problem, first in the North, and later in the South. The isolation of morphine in 1805, the marketing of heroin in 1898, the discovery of the barbiturates and of the amphetamines in 1882 and 1927, respectively, has meant a quantitative and qualitative change in substance-abuse patterns.

The pace of pharmaceutical advances has continued virtually unabated throughout much of the 20th century. The discovery of the benzodiazepines, a multitude of tranquilizers and hypnotics marketed at a furious pace during the 1950's and 1960's, has led to one of our most recent, and perhaps our most pernicious drug abuse problems. Modern pharmacology is transforming drug abuse patterns around the world. Everywhere, but principally in the cities of Asia and the Near and Middle East, opium smoking is giving way to intravenous heroin use, the amphetamines, the barbiturates, the tranquilizers and the sedatives. The flow of illicit drugs is increasingly from North to South.

#### A TWO-WAY TRAFFIC

According to the UN's International Narcotics Control Board (INCB), the major international control problem in the world now is diversion from huge overproduction of amphetamines and methaqualone. This occurs because exporting countries do not insist on a valid import certificate having been received, and allow shipments to free trade zones — particularly those in Europe — where drugs are repackaged and relabelled as "Vitamin C," or other such innocuous products. Almost everywhere across Africa, Asia, and the Middle East, there are important seizures of illicit supplies of psychotropics, particularly methaqualone. These reflect widespread abuse of mood-modifying drugs in the Third World, often in combination with the more traditional substances such as the opiates and cannabis. International regulatory agencies are agreed that this emergent pattern of intoxication in the developing world presents new and serious health hazards.

Chemical and pharmaceutical companies have turned to the developing world for a new market where the scope for the sale of psychotropics is enormous. Rising standards of living, the relative shortage of doctors and inadequate national regulations are seen as ideal factors for the self-prescribing of psychotropics. In 1970, excluding China and the Eastern Bloc countries, the total international wholesale value of all pharmaceuticals was estimated at just under CA\$22 billion.



*Smoking opium in Thailand: about half of production is consumed regionally.*



It was expected that in 1980, the world market would be about CA\$55 billion.

## THE DEVELOPMENT PERSPECTIVE

The 92nd U.S. Congress, of 1971–1972, in a frenetic pre-election period, saw the introduction of no fewer than 102 bills related to international narcotics control, many calling for the suppression of U.S. aid to developing countries that failed to curb production. Fortunately, the setting up of the United Nations Fund for Drug Abuse Control (UNFDAC) in 1971, has given great impetus to the notion that crop substitution is the most feasible long-term strategy to follow in international drug control.

In 1976, Pakistan, with substantial financial support from the Federal Republic of Germany, signed an agreement with UNFDAC for a 1400-hectare pilot crop-substitution program in the Buner area of the Northwest Frontier Province. Two years later it was found that revenue from farming systems where high-yielding wheat and maize varieties had been introduced was as high as or higher than the income obtained from cultivating opium. The research work also indicated a good potential for sugarcane, peanuts, and potatoes. There was also some potential for the cultivation of high-value medicinal and herbal plants, as well as fruit trees planted on terraces where they would add income without displacing other food crops.

In Burma, a large-scale program involves a host of UN agencies and includes crop eradication as well as substitution. That is, once a farmer's poppy crop has been destroyed, he is then offered assistance to switch to other food and cash crops or to embark on other agricultural ventures. The program calls for agricultural base stations to produce seedlings, silk worm eggs, and livestock for distribution to the cultivators. Extension centres will ensure proper utilization of the material distributed from the base stations, backed up by training programs for young farmers and demonstration centres in villages. An evaluation of the Burmese program claims a "fascinating success story," with a dramatic reduction in the opium crop, and over 16 000 hectares eradicated. The evaluation appears to be a little enthusiastic. It does not take into account a severe drought that is known to have drastically reduced the opium crop in the entire Golden Triangle at the time of the program. The fact that Burmese opium

production was reported at 500 tonnes — as high as it has ever been — in 1981, is a strong indication that the success of the Burmese program is less fascinating than is being claimed.

The most important venture of UNFDAC in crop substitution has been in Thailand. The project has involved setting up 11 experimental stations and a research training centre. Successful crop development at experimental stations has included coffee, new varieties of upland rice, kidney beans, navy beans, off-season vegetables (such as lettuce and carrots), peaches, passion fruit, field corn, and potatoes. The returns from some of the substitute crops compare favourably with revenue from the sale of opium, especially in the case of coffee.

The Thai program was planned and implemented with great care. It included the provision of primary health care; the development of handicrafts; the provision of marketing, trading and storage facilities; the researching into opium abuse among the hill tribes; and the training of workers in the treatment of abusers. It is estimated that, in the participating villages, opium production has been cut by half. Program officials are confident that they have

identified suitable replacement crops and, more importantly, have enlisted the cooperation and trust of the growers and their families.

Crop substitution in coca-growing regions presents serious, though not insurmountable, difficulties. A perennial with a well-developed root structure, the coca bush calls for a far more vigorous effort to be eradicated than the rather fragile poppy plant. A suitable alternative crop has not yet been identified, although the U.S. State Department's Bureau of International Narcotics Matters, for one, has been funding several pilot agricultural projects in the Chapare region of Bolivia. There are also similar projects in the Upper Huallaga region in Peru, where there is extensive illicit coca production.

The case of cannabis presents more serious obstacles. The volume of trade is enormous, the plant grows wild, and the correlation between the poverty of the grower and the crop is less consistent. The profit-motive is also likely to remain irresistible, because demand is rising as use continues to penetrate Western culture and finds favour with middle-class youths around the world.

As to the pharmaceutical industry and North-South drug flow, the future looks bleak. Unbodies have at best a tenuous restraint on the industry, and even that is now seriously threatened. Several major producing countries, such as Hungary and the Federal Republic of Germany, are preparing to defect from international accords regulating preparations containing phenobarbital. And the prospect of the benzodiazepines being added to the 1971 Convention on Psychotropic substances, as urged by a number of developing countries, is doomed now that manufacturers have successfully lobbied against it.

The development option, largely unproven and exploratory, nonetheless reflects the reality that narcotics production is rooted in chronic rural poverty and ill health. It is therefore a more optimistic approach than strict law enforcement that has repeatedly resulted in consumers switching to more easily smuggled and potent forms of drugs; and in cultivation being pushed back into more remote, distant areas, or to new regions and countries altogether. □

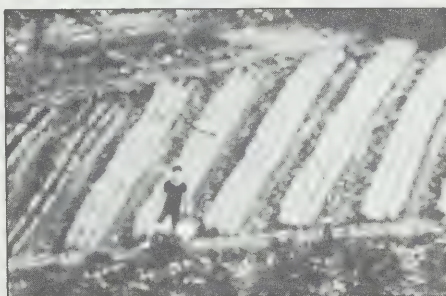


Photo: David Archibald

Replacement crops in a hill village.

## A COOL SUBSTITUTE

The storage of substitute produce is essential to a successful rural development program in the Golden Triangle. In northern Thailand, IDRC is funding research into the development of passive water-cooling for substitute crops such as apples, pears, strawberries, lettuce, tomatoes, celery, and a variety of cut flowers. In the proposed cooling system, a reservoir of cool water at the top of a simple and inexpensive structure provides a heat sink into which heat is conducted from the interior of the storage chamber. During the day, the water is shielded from solar radiation and insulated from the surrounding warm air. At night, the shielding is removed and the water loses heat by radiation to the night sky. The project will be carried out primarily by the Department of Mechanical Engineering at the University of Chiang Mai.

Vegetable seed production appears to be a viable high-value crop for the hill tribe farmers of northern Thailand. Another IDRC-sponsored project will concentrate on the production of tomato, lettuce, sweet corn, Chinese radish, and leaf mustard seeds. This would help reduce the country's dependence on imported seeds that are often ill-suited to the Thai environment. It would also increase the cash income of hill tribe farmers as well as lessen the uncertainty inherent in their present agricultural activity.

*André McNicoll is senior writer in IDRC's Communications Division. This article is based on a study by the same author and just published by the Ottawa-based North-South Institute*





Dr Mujibur Rahaman

# A SAVING SOLUTION

INTERVIEW BY NEILL MCKEE

*Oral rehydration therapy (ORT) is a simple and inexpensive way of treating the loss of essential fluids and minerals that accompanies diarrhea — the major complication of diarrhea and a principal cause of an estimated 5 million deaths a year of children under five years of age. UNICEF, in its State of the world's children 1982-83 report, estimated that widespread acceptance of ORT "could save the lives of up to 13 000 children every day." Dr Mujibur Rahaman, senior scientist at the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in Dhaka has been closely involved with the development of ORT. IDRC film producer-director Neill McKee interviewed Dr Rahaman in Teknaf, Bangladesh, recently.*

**IDRC:** What is the history of oral rehydration therapy (ORT)?

**Rahaman:** Well, ORT was developed quite a while ago, but recently it is getting more and more publicity and wider acceptance as a simple and relatively inexpensive way of replacing the water and electrolytes lost during acute diarrheal attack. If the loss of fluid and electrolytes is reversed, life can be saved without use of expensive intravenous fluid. The scientific fact on which this method is based was discovered some decades ago. It was observed that glucose facilitates the absorption of sodium and water — reversing the process of fluid and electrolyte loss caused by toxins attacking cells. We considered that this action could be used as a technique for increasing the fluid absorption in the small intestine of people who had cholera. In 1976, the former Cholera Research Laboratory in Bangladesh [now the International Centre for Diarrhoeal Disease Research, Bangladesh

(ICDDR,B)] observed that when a solution with the necessary electrolytes was introduced into the intestine of cholera patients for a period of perfusion, as the method was called, and glucose was added, there was net increase in the absorption rate of fluids from the small intestinal lumen into the gut mucus membrane. So there was positive absorption of fluid. Instead of the cholera patients losing fluid, they were absorbing it. Now, following that experiment, we carried out a series of clinical investigations. They proved that, indeed, a solution containing electrolytes, if it has 2-3 percent glucose, can be used to replace the fluid and electrolytes lost during cholera. Subsequently, it was further simplified by replacing glucose with ordinary sugar, sucrose. Glucose is not universally available; sugar was found to be working almost... almost as well as glucose. We were not the only persons involved in developing ORT. The former International Centre for

Medical Research and Training in Calcutta run by the John Hopkins University (U.S.A.) also played a crucial role.

**IDRC:** What then, are the standard ingredients of the ORT mixture?

**Rahaman:** As it is used in Bangladesh, the mix is 3.5 g of sodium chloride, or common salt, 2.5 g sodium bicarbonate, and 1 g of potassium chloride. To this one should add either 20 g of glucose, or, if you don't have glucose, 40 g of sugar. This mixture should be dissolved in one litre of plain drinking water. Plain sugar — table sugar or sucrose — is good enough. We have found that acceptability of the ORT is somewhat better if you have sugar rather than glucose, because sugar tastes a little sweeter than glucose and children seem to accept it better.

**IDRC:** How much is usually needed?

**Rahaman:** That depends on the severity and the duration of diarrhea. Our calculations have shown that, as a rule of thumb, a child of 10-12 kg may require little more than a litre in about 24 hours. If the child has diarrhea of sufficient severity, it might require more than a litre. If the diarrhea is prolonged, it might require 2 litres. But children who require more are the ones who are in danger of dying from dehydration — we always warn parents to be watchful, because further treatment and follow-up, like intravenous fluid administration or examination by a physician, may be required.

**IDRC:** How widely used in Bangladesh is ORT?

**Rahaman:** A national program is currently providing the ORT in remote rural areas, and I think at present one-third of Bangladesh is covered — about 30 million people.

**IDRC:** Is this program working through government health services or other agencies?

**Rahaman:** The national health service is distributing the solution free of cost in the villages where they have health volunteers. However, ORT is also available in the rural health centres or health posts. Recently, several private manufacturers have marketed ORT, but they are using glucose rather than sugar. The price is quite reasonable, it is about 2.5 taka (about CA\$0.13) per package, which makes one litre.

**IDRC:** What needs to be done to have ORT more widely accepted?

**Rahaman:** Although ORT is simple to make and simple to administer, one has to exercise some degree of caution with it in order to prevent infants getting dangerous symptoms like hypernatremia. It is extremely rare, but can be a rather serious complication, leading to brain



swelling and convulsions. Hyponatremia means too much sodium in the blood serum. If the ORT solution is not made properly — if it is made too strong or given with too little water — and if the child had some other illnesses along with diarrhea, like high fever, and is losing a lot of water through sweating, then the child may retain too much sodium. But this is easy to diagnose: The child is very thirsty and usually refuses ORT. If plain water is given, or breast-feeding is continued — which should be done for all diarrheal infants — then the danger is minimal.

However, the main constraint to the universal acceptance of ORT that we see is that some training is necessary either to the intelligent mother or to some neighbourhood agent to demonstrate how to make ORT in appropriate strength and how to administer it to the child. Once this is done, the therapy could be recommended universally. The health service here in Bangladesh is quite appropriately exercising caution, because universal availability without training may be dangerous.

**IDRC:** Would you say then that hygiene education is the necessary "software" for the ORT "hardware"?

**Rahaman:** The ORT makes it possible for health educators to enter into the family, so to speak. It is an entry point. When you treat a child at a very crucial period when life may be in danger, the whole family will listen to the person who is providing this life-saving therapy. And health education is retained in that situation. The family is in a very receptive mood. Giving them hygiene education at the same time as providing oral rehydration therapy is an extremely effective way of approaching this particular problem of diarrhea and its high endemicity in poor societies.

**IDRC:** Can the therapy be refined further, by the addition of water purification chemicals, for instance — or is this necessary?

**Rahaman:** Well, there is some controversy on this point. We follow the WHO advice: Use the best possible drinking water. If we tell mothers to boil water, then there may be some problem in accepting ORT, because fuel is scarce, and boiling involves making additional efforts. That is one reason. The other is that we think that ORT should not be used after twelve hours, it should be thrown away, or at maximum, kept 24 hours. Some experiments have shown that the ORT can become slightly contaminated with bacteria. But this is a minimal risk, because the children who have diarrhea are usually accustomed to drinking water that is not absolutely pure.

I would not routinely recommend boiling of water, because of the fuelwood scarcity. In some situations

water should be boiled, then cooled. If you add the ORT mixture to boiling water, then the sodium bicarbonate will lose its carbon dioxide and will become sodium carbonate, which is toxic. So there is a danger in boiling water and using it hot.

**IDRC:** What about chemical water purification?

**Rahaman:** The commonest water purification is the chlorine tablet. We have not experimented ourselves on the effects of adding chlorine tablets. If it is available, and the mother knows how to use it, I can see no reason why it can not be used. But I would not, again, routinely recommend it in case mothers begin to think that without chlorine ORT is going to be useless. I think this would really be an impediment to the program.

**IDRC:** But if diarrhea is caused primarily by impure water, how can you expect ORT to be effective if made with the same sort of water source?



*Oral rehydration in progress in Bangladesh: a technology to save millions of lives and dollars.*

**Rahaman:** It is not entirely correct to say water is the main problem or causative factor in producing diarrhea. In infantile diarrhea, diarrheas during the first 6 to 18 months of life, we think that the cause is most often a virus. Viral transmission is not associated with water. This is one of the most vulnerable periods for diarrhea. And in the subsequent period, that is, from 18 months to about three years, the disease is mainly due to shigellosis or *E. coli* bacteria.

Now, water can affect the incidence of diarrhea in various ways. The mother's hygiene can be affected by the availability of water, not just the quality but also the quantity. Water purity may not be the most crucial factor in producing diarrhea. It's the large volume of water that allows the mother to maintain hygiene at a high level that may be more important than the exact bacterial count in the water. In

shigellosis, for example, washing the hands repeatedly if there is a good source of water — when I say good, that means a plentiful source of available water — is a way mothers can help to cut down the transmission of shigellosis from one child to another. So water may be playing an important role, but only indirectly, not as the main vehicle of transmission. Although cholera is caused by water, some enterotoxigenic *E. coli* diarrheas, as we know now, are caused by both water and food. So it's not just water alone. Lack of water is far more detrimental than water that may be slightly contaminated.

**IDRC:** What is in the future for ORT and research on diarrheal diseases?

**Rahaman:** I think the most exciting study going on is in Teknaf right now, measuring the impact of water and sanitation on diarrheal diseases. This study is principally supported by IDRC, and partly supported by UNICEF and of course, the ICDDR,B. This study will compare the efficacy of availability of large volumes of relatively high-quality water close to the home. And at the same time, we are providing health education to promote the use of this water as carefully as possible so it will not become contaminated. We are also providing latrines, and education to support their introduction and proper use.

Previously, the criteria used for evaluating the impact of water and sanitation was the broad category of incidence of diarrheal disease. As I have mentioned, diarrhea can be caused by a variety of bacteria and viruses. As recently as 10 years ago, the technologies were not available to determine the causes of specific diarrheas in children. Now, our study has incorporated a method which will diagnose most of the causes of diarrhea. The reason why this is important is because a viral diarrhea may have a different way of transmission, probably by air. The *shigella* organism, which is another cause of diarrhea (shigellosis), is probably transmitted person-to-person, from hand to mouth. And then, you have other categories of diarrhea like enterotoxigenic *E. coli*, which is transmitted both by water as well as by food. So through our experimental design, it will be possible to determine the various causes of diarrhea and, at the same time, as long as we know the cause of diarrhea, we can tell which particular technique worked best against it. Was it the good water from a handpump that worked, or the large volume of water that worked, or the acceptability of simple health education measures and ORT? So it should be possible in future to identify the effectiveness of specific health education measures or technologies independently and in combination. □





## THE KAFUE FISHERIES EXAMINED

# CATCHING UP

FIBI MUNENE

**E**arly in the morning every day, an army of small traders — most of them women — starts arriving at Chanyanya fishing camp in buses, in hired cars, on bicycles, and on foot. They cluster around incoming canoes, bidding furiously for the supplies of bream being landed. After cleaning the fish near the landing, they head off immediately for Lusaka and towns near the Kafue Floodplain Fishery to sell their stock.

Chanyanya is one of the numerous fishing camps that have sprung up on Lake Kafue, about 70 kms from the Zambian capital of Lusaka. Because of a scarcity of jobs in the urban areas, the number of people taking up fishing as a livelihood is on the increase. Research done by the Institute of African Studies at the University of Zambia in Lusaka indicates that the fishing industry at Kafue provides about 10 per cent of the fish produced in Zambia, and self-employment for 6000 fishermen.

Fishing is an attractive enterprise, especially to young Zambians who are jobless. It does not require a large amount of capital to enter the industry. And as fish is in great demand in the urban markets, new fishermen and traders can be assured of cash income immediately on starting work.

The Kafue River, which creates this inland fishery, rises in north-central Zambia, flows south-eastwards through the Iteszi Tezhi Gorge and then turns eastwards for about 240 kms along the Kafue Flats. The Flats have more than 450 kms of shifting river shore. According to fishery biologists, the annual inundation of the vast floodplain sets the conditions for the production of some 70 species of fish. The fish breed and grow rapidly during the rainy season, feeding on plants and other nutrients such as cattle manure deposited on the floodplain. In the dry season, the falling river flood drastically reduces the fish environment and their population.

Fishermen have adapted themselves to the changes in the floodplain, moving to higher ground when it rains and to riverside fishing camps during the dry season. As supplies of fish fluctuate

due to the flooding cycle and are scattered along the 240-km length of the fishery, fishermen and small-scale traders must migrate to follow the fishery.

The life of a fisherman can be hard. There is always the danger of encountering hippos. Because hippo manure fertilizes the water for algal growth, and thus indirectly provides fish food, most fishermen know that the animals' habitual resting and grazing grounds usually provide good catches. Although fishermen try to avoid the animals as much as possible, it often means forsaking the favoured fishing grounds. Each year several fishermen are killed by the hippos.

Living conditions at the fishing camps are hard, too. Houses are constructed of reeds, and material possessions usually consist of only basic fishing equipment and utensils. Although there are many children in some fishing villages, there are neither schools nor clinics.

According to surveys by the Zambian Fisheries Department, the inaccessibility of much of the Flats to traders in high water creates a paradox for fishermen. When fish are plentiful, the traders cannot reach them. On the other hand, during the dry season, fishermen's lower catches often do not keep up with the demand. As a result, some fishermen resort to a destructive and illegal method of fishing locally known as *kutumpula*, which involves driving the fish into waiting nets by beating the water surface with wooden plungers.

*Kutumpula* is a symptom of overfishing in some parts of the Kafue fishery. Another is frequent violation of the Ministry of Commerce's regulated prices for fresh and dried fish. As a result, most of the fish trade is considered by the government to be illegal, and traders and fishermen who overprice their fish risk being arrested.

A project recently funded by IDRC at

the Institute of African Studies is investigating ways in which the economic status of the less privileged fishermen and traders can be improved. This could include loans for particularly important equipment, such as boats. Although some fishermen have well-built boats, which cost about 2200 *kwacha* (about CA\$2250), the majority use dugout canoes. Chief researcher Dr Peter Hayward is working with engineers from the University to determine if cheaper, but sturdy, boats could be constructed. This would also help in overcoming one of the major occupational hazards: attacks by hippos.

The project is experimenting with low-cost solar fish driers in an attempt to improve the quality of dried fish. The present method of drying fish with firewood has problems. Fuelwood is hard to obtain in the Flats, and is usually bought from nearby farms at a high cost. Due to this scarcity of firewood, fish is often poorly dried and is spoiled by mould, blow-flies, and beetles. To avoid such losses, some traders have started spraying their fish with insecticide — a health hazard to consumers.

Some innovative research techniques are being used in this project. For example, the technology of the fishermen is being videotaped so that it can be analyzed and improved. The same method is used to record details of social life in the fishing camps, and fishing strategies. The technique will enable Dr Hayward and his assistants to present research tapes and taped interviews with fishermen and traders to fisheries officials, so that they can vividly see the conditions and problems in the fishery.

There is also an attempt to organize fishermen, traders, and their small villages in order to improve their leverage in influencing government policy. With careful management, the small-scale fishing industry in Lake Kafue can itself become a renewable resource, providing employment and food at little cost to Zambia. □

*Fibi Munene is regional liaison officer, IDRC, Communications Division, in Nairobi.*





## A NEW AID INITIATIVE FROM AUSTRALIA

### ACIAR

#### DAVID SPURGEON

*(Above) Dr J.R. McWilliam*

**I**ndustrialized Australia is, in one sense, part of the North. But geographically and climatically, the country has a lot more in common with its developing neighbours of the South in Asia.

With this in mind, the Australian government last year launched a multi-million dollar venture to help share its agricultural research expertise with developing countries. The newly created organization, the Australian Centre for International Agricultural Research (ACIAR), is headquartered in the national capital, Canberra.

The ACIAR will complement the work of the Australian Development Assistance Bureau (ADAB), the official Australian aid agency. Its prime function will be to develop collaborative research programs between scientists in Australia and in the developing countries, to identify and help solve some of the latter's important agricultural problems.

"In this respect, we believe Australia has a unique advantage," says Dr J.R. McWilliam, ACIAR's first director. "It is perhaps the only industrial country whose domestic agricultural research experience has been gained in climatic conditions that closely correspond to those in regions in which one-third of the world's poorest people live. There was nothing unique about our expertise in, say, energy or health or industrial research. But our agricultural research had a special relevance for developing countries." In much of its research, he adds, Australia has developed a strong mission-oriented focus on problems of crop and animal systems common to much of the developing world.

A trust fund has been established to support ACIAR. It will receive annual appropriations from Australia's aid budget. The initial three-year commitment is about 3 percent of this budget, or AU\$25 million (CA\$27 million). "This may seem to be a small component, but, because it involves interaction between scientists, its long-term cumu-

lative effect can be substantial," says Dr McWilliam, formerly Professor of Agronomy and Head of the Department of Agronomy and Soil Science at the University of New England in New South Wales.

The Australian government decided on a research orientation for its new development assistance initiative because it was convinced the value of research had been proven. Dr McWilliam cites the success of various members of the worldwide network of International Agricultural Research Centres (IARCS) in increasing food production in the developing world. The IR36 rice variety developed by the International Rice Research Institute (IRRI), for example, has become the most widely grown variety of any food crop the world has ever known. Agricultural economists estimate that Asian farmers harvest an additional five million tonnes of rice each year, and gain more than CA\$1 billion extra income by planting this variety.

"While Australia fully realizes," says Dr McWilliam, "that research is only one of the inputs needed to improve agricultural outputs in developing countries — along with credit, infrastructure, and marketing, for example — it nevertheless plays an important catalytic role in encouraging investment in other components of the agricultural system."

The ACIAR's initial research priorities have been grouped into 10 programs: soil management and land use, plant improvement, plant protection, plant nutrition, animal production, animal health, farming systems, postharvest technology, forestry, and agricultural economics. The Centre will also place emphasis on communicating its research results through publications and other means.

Although ACIAR is barely a year old, it has already launched projects to improve storage of grain in the tropics and to develop high-yielding cultivars of pigeon pea, which is particularly suited to semiarid environments in Asia and Africa. In India, researchers are investigating more efficient use of rice and straw as animal feed. The Centre is also helping to develop a computer-based system to identify virus diseases of plants, particularly tropical legumes.

The ACIAR will focus primarily on Australia's near neighbours, including Southeast Asia, Papua New Guinea and the South Pacific islands, and South Asia. It also intends to work with scientists in certain countries in tropical and subtropical Africa south of the Sahara, as well as other countries if it has the particular expertise needed.

Australia, through its international aid program, makes a significant contribution to the core funding of the IARCS. Because of this, ACIAR hopes to maintain close and active links with the IARCS, concentrating its collaborative research efforts on them by means of their outreach programs, in which they work alongside developing country scientists in national programs.

In some respects, ACIAR has been based on the IDRC model, says Dr McWilliam, noting in particular the similarity between his Centre and IDRC's cooperative programs, which promote collaboration between Canadian and developing country researchers.

"ACIAR's philosophy is based on a partnership approach. We believe the most effective form of research aid will come from a close collaboration that results in a strengthening of the developing countries' capacities to solve their own problems through research. Our motives are both humanitarian and enlightened self-interest — the two are not mutually exclusive." □

*David Spurgeon is a freelance science writer and communications consultant.*



## CO-OPERATIVES — TOOLS OF SOCIOECONOMIC DEVELOPMENT

ALEKSANDRS SPRUDZS

**C**o-operation and mutual aid, as old as humanity itself, are natural instincts and traditions everywhere. Although the application of co-operativism to business transactions is a recent phenomenon, co-operative organizations have made their impact on hundreds of millions of people around the globe.

Experience with various methods of assistance has increased the popularity and acceptance of co-operativism. It is an effective, appropriate, and flexible system and instrument of development, and has proved itself adaptable to new challenges and situations. Co-operative organizations have been established in most developing countries and in almost every type of economic, cultural and political circumstance.

In nearly all states of the Third World, co-operatives have a significant, and

sometimes even primary, role in official development programs. They have a recognized role in the development process in which the efforts of people themselves are united with those of authorities to improve the economic, social, and cultural conditions of communities. Co-operatives are also part of the development process that integrates these communities into the life of the nation and enables them to contribute more effectively to national progress.

The Kenyan National Co-operative Development Plan (1976–1980), for example, recognized that small-scale farmers provided the backbone of Kenya's agricultural economy, and that any major thrust in the agricultural sector would have to come from these farmers. The plan looked to co-operatives to be the major instrument in effecting the required thrust. Co-ops were seen as means of facilitating expansion of agricultural credit and technological change, and of providing agricultural extension services and farmer education.

In a number of

developing countries the co-operative component of development has been accepted as a competitive "third alternative," between unrestricted capitalism and complete dominance by the state enterprise bureaucracy.

Because of the impact co-operativism has had over the decades in developed countries, the idea of establishing co-operative organizations to help developing people has not lacked advocates nor patrons. Governments, intergovernmental bodies, and international agencies and organizations such as UNESCO, the Food and Agriculture Organization of the United Nations (FAO), and the UN Industrial Development Organization (UNIDO), support the idea in principle or with actual assistance programs.

The highest councils of the UN have praised the contributions of co-operatives to socioeconomic development, and have urged adoption of policies creating a conducive climate for their existence and operations. In addition to resolutions endorsing co-operative

principles in development, the United Nations General Assembly has stressed the role co-operatives can play in the development of weaker sections of community in overall social and economic advancement. It also has underlined the role of co-operatives in involving people at a grass roots level in planning and decision making.

The International Labour Organization (ILO) has characterized co-operatives as important instruments of progress in developing countries that provide the means for the masses to be involved in the process in a democratic and evolutionary way. Voluntary co-operation, says ILO, with its promotion of full knowledge, discussion, confidence, equality in control, and the greatest possible degree of self-reliance, has no equal.

The International Co-operative Alliance (ICA), with over 355 million members in co-operatives in 65 countries, and the World Council of Credit Unions (wccu) with 60



Community water scheme in Kenya: a tradition of cooperation.



million members in co-operative credit organizations in 70 countries, also are major factors in the development scene.

Either directly or through responsive national co-operative organizations in developed countries, the international co-operative sector acts as a catalyst for socioeconomic changes in developing countries.

To understand the reasons for such a widespread recognition and support for the growth of co-operatives in Third World countries within their national economic programs, one has to take a closer look at the nature, essence and purpose of development, of the participation of people in the process, and the impact of co-operative organizations.

The wealth of a country lies, to a great extent, in the productive capacity of its citizens. A developing country can thus be seen as a country in which neither the human nor the natural resources are used to produce socio-economic benefits to the extent needed and possible. Development is generally regarded as the creation of a social and economic change, accompanied by overall growth and improvement. The purpose of national advancement programs is to reach the point where growth is self-sustaining.

But the objectives of progress should not be restricted just to economic targets; objectives should include empowering people to use their potential, energies, and abilities for improvement of their own condition.

The strong predominance of economic goals makes the development process somewhat restricted, less effective. Unless a program awakes, mobilizes and stimulates a will for self-help within the majority of people, ongoing and effective development may be difficult.

People begin to exercise their own choices concerning the matters

that affect them as soon as they reach full awareness and understanding of processes governing the events around them. Freedom of choice concerning developmental targets should entail also the freedom of choice of the methods used to achieve the goals. What particular tools are chosen and who controls the use of them are often the key to motivation for active participation in developmental activities. The closer the chosen tool and its manner of use is to the accustomed pattern of life, attitudes and values of people, the more effective the development process is going to be. One has to be careful to avoid beginning any reform that may run ahead of capabilities and opportunities of the people to take part in it.

Co-operative organizations are basically associations of people that take the people as they are, and help them to reach progressively the levels of involvement to which they aspire, and at the speed they set themselves.

Co-operativism, represented by co-operative organizations, is an economic system with a social content. It is, in fact, an educational movement employing economic action. Some movements have a broad business base, others have high social aims, only co-operativism has them both.

In co-operative business organizations, the functions of owners, users, and controllers are all joined in the membership to produce a unity of purpose and expectations. Co-operatives combine economic benefits with social goals and ensure that achievements and gains stay with the people who created them. Co-operatives have a soul and a human face, and help people "to have more and be more."

They provide their members with an environment in which they can develop individually their knowledge and skills,

and can earn the special recognition and respect they desire and deserve from their neighbours. It is quite common for active participation in co-operative activities to bring forward new leaders whom others can trust and follow, and who in return respond to such acceptance with a vision of a future for all.

In Tanzania, for example, co-operatives were important tools in developing economic and political awareness well before independence. In parts of colonial Tanganyika where co-operatives were active, the population learned about the democratic process and selection of leaders in their co-operatives before they could exercise democracy in political processes across the country. As a consequence, the co-operative movement provided an important share of local and national leaders when independence was attained.

Co-operatives also have proven their ability to raise standards of living by bringing total returns of resource development and other economic activities back into the hands of the people who had been direct participants in those activities. Elimination of profiteering intermediaries by services of local marketing or merchandising co-operatives has resulted in increased personal benefits for members, as well as increased over-all credibility of self-help organizations. The spectacular success of savings and credit societies in Kenya is one illustration. Between 1973-1979, 125 co-operative savings societies grew to 630, and increased savings from 2 to 300 million Kenyan shillings (from about CA\$190 000 to about CA\$28.5 million). It is an indication of an effect the co-operative mobilization of people and their means may have on the national economy in general, and on the expansion of monetary economy and the financing of activities

in the co-operative sector, in particular.

An effective co-operative does not just happen. It takes some serious input — explanation, education and preparatory work with local groups of people. Co-operatives also have to exist in a favourable and understanding social and political climate that stimulates their formation, and, at the same time, protects them from unwarranted external influences.

An improper, hurried or even forced creation or expansion of a co-operative organization fails. Without preparatory work and education, the results are formal bodies without human content and without a base for natural growth processes for future development. Impatience with the natural growth in acceptance of the co-operative idea, and with the lack of understanding that every program and project has its particular development cycle, slows, confuses, or even kills the expected development.

It is insufficient attention to the basics of a development process with human involvement, and to the input and timing required — or misdirection of the development of co-operatives and occasional misuse of co-operative structures — that causes co-ops to fail. While the advocates of co-operatives as development tools are concerned with such failures, it is evident that the failures have not been caused by any inherent weaknesses in co-operative structures, but rather by the improper use of them.

Co-operative organizations should continue to be rated as one of the most suitable tools for the involvement of the largest underutilized resource the developing countries have for development — the people themselves.

*Aleksandrs Sprudzis is the author of Technical assistance delivery to developing cooperatives, a study based on work carried out as part of an IDRC fellowship.*



# BRIEFS

## Grain gain bacteria

*Bacillus thuringiensis*, a beneficial bacterium used as a biological insecticide on some crops (and experimentally against the mosquito and blackfly vectors that spread river blindness and malaria) may also have potential in protecting stored grain against insect attack.

Scientists at the United States Department of Agriculture (USDA) have noted that *bacillus thuringiensis* occurs naturally in some grain stores. The bacterium produces a toxin that is believed to paralyze the digestive system of certain insect larvae that ingest it. USDA scientists are now collecting isolates of the organism from grain dust and screening them for activity against stored-grain insects.

As the bacterial toxin affects only certain insects and is harmless to other life forms, the work may lead to a safe and low-cost means of reducing postharvest grain losses in developing countries. (*The Furrow*)

## Dangerous milk

In Western countries, infant milk formula is normally fortified with iron to combat deficiencies of the mineral in young children. In the Third World, however, the practice could pose a serious health risk.

There is now considerable evidence that an iron-rich environment enhances the growth of micro-organisms. In the industrial countries, where milk is processed under sterile conditions and usually prepared by mothers in sanitary surroundings iron-fortified formula does not pose a health hazard. But in Third

World countries, the likelihood of pathogenic bacterial contamination — either when the iron is added or when the milk is prepared by the mother — is much greater.

If iron does in fact help the bacteria to proliferate, it will do so not only in the milk itself but, once ingested by the child, in the gastrointestinal tract, possibly causing diarrhea.

In Chile, the government is planning to fortify all the infant formula distributed through its National Health Service's milk supplementation program. But there is concern about the risk. The Institute of Nutrition and Food Technology at the University of Chile in Santiago, with IDRC support, is therefore investigating the problem.

The researchers are already familiar with the kinds and quantity of bacteria that find their way into the formula milk used by Santiago's poor mothers. They will replicate these conditions in samples of both a typical iron-fortified formula and a standard unfortified formula. The sample, kept at 32°C, will be checked every half-hour for four hours — the length of time that Chilean mothers often store prepared formula at room temperature. These tests will enable the scientists to determine what effect the iron has on the proliferation of bacteria.

## Improving doctors

Testing has revealed serious shortcomings in the knowledge and performance of China's million "barefoot doctors," the medical auxiliaries who extended health care into almost every corner of the country.

Results from a sampling

involving 10 000 compulsory examinations revealed that only about one in five health workers was able to meet even rudimentary standards of medical proficiency.

The PRC is launching a new campaign to train more conventional physicians and improve medical teaching. At present, 126 000 students are enrolled in China's 113 medical schools, learning both traditional Chinese and contemporary Western medicine. With fewer than 400 000 trained

physicians to serve a population of over one billion, China is seeking assistance to build and strengthen its professional medical resources.

Canada is supporting a 5-year exchange program between the University of Toronto and the Sichuan Medical College in China that will see personnel from clinical science, pharmacy, and dentistry study and teach in Canada and China.

## Global futures digest

"It is high time that those who plead for a genuine understanding between North and South, as well as those who incessantly argue that we should design a plausible and possible future, should have a common meeting ground."

So writes editorialist André van Dam in the charter issue of *Global futures digest*, a new quarterly magazine that aims to cover the twin fields of futures research and international development.

The magazine is published in Toronto, Canada, by Global Futures Network, an international nonprofit NGO whose stated goal is to "help transform the creative ideas of this age into constructive action for a better human future." Both the Network and its *Digest* are supported by the Canadian International Development Agency.

The first issue of the magazine is a full 80 pages of opinion, conjecture, reportage, and prescription, covering topics from the

psychology of international development to the dilemma of the international banking system. A 24-page insert of short, varied news items under the title "Spectrum" focuses on science and technology.

For more information: Global Futures Network at one of the following addresses — 26 McGill St., Toronto, Canada M5B 1H2, or 181 Rewa, Haji Ali, Bombay, India 400026.

## Diarrhea journal

Despite recent medical developments such as oral rehydration therapy, diarrheal diseases still kill more people in developing countries than any other disease.

Public ignorance of proper hygiene and sanitation is the culprit. But added to the lack of information at the grass roots is the parallel problem of information flow among researchers trying to solve the problem.

The need for effective information programs for Third World scientists is particularly acute in Asia because library collections are weak, authors have difficulty getting their papers published in recognized journals, and the cost of journals is prohibitive.

To help tackle the problem, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in Dhaka has launched, with IDRC help, an information service and documentation centre. One of its offspring is a new quarterly, the *Journal of diarrhoeal disease research (JDDR)*, which published its inaugural edition earlier this year.

The English-language journal will carry original research articles, letters, and an annotated bibliography of current Asian literature on diarrheal diseases. Research articles will be subject to peer review.

For more information contact: Md S I Khan, Managing Editor, JDDR, ICDDR,B - DISC, GPO Box 128, Dhaka 2, Bangladesh.



## Universal primary education in Tanzania.

I.M. Omari, A.S. Mbise, S.T. Mahenge, G.A. Malekela and M.P. Besha, IDRC-TS42e, 87 pages.

"This study on the program to make primary education universal in Tanzania was conceived for two purposes," says the senior author, "to generate discussion and support among academics for this historical event and to generate data, both primary and secondary, that could be used for formative development of the program..." The publication covers the concept and purposes of universal primary education in Africa, quality versus quantity issues in education, and offers some conclusions and recommended actions.

**The fragile web: the international agricultural research system.** Published by IDRC in collaboration with the Canadian International Development Agency and the Consultative Group on International Agricultural Research, 27 pages.

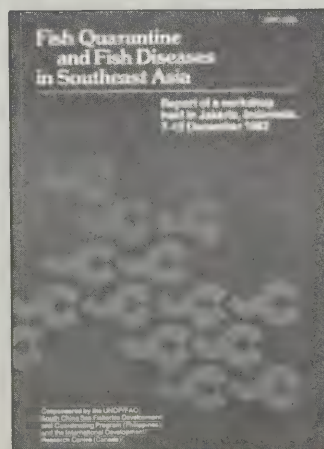
A brief account of the evolution of an international system established to nurture agricultural research, ensure effective allocation of resources, and improve the quality and quantity of food production in developing countries. The booklet outlines the rationale for such a system, describes the 13 member international agricultural research centres and their work, explains how the global system is coordinated, and reports on new directions for agricultural research in the future.

Also published in French as *La trame fragile: le système international de recherche agricole*.

## Fish quarantine and fish diseases in Southeast Asia: report of a workshop held in Jakarta, Indonesia, 7-10 December 1982.

Cosponsored by the UNDP/FAO South China Sea Fisheries Development and Coordinating Program (Philippines) and the IDRC, 79 pages.

Evidence indicates that the uncontrolled entry of live fish into countries of Southeast Asia has at times resulted in the transfer of pathogenic parasites and microorganisms that pose a great economic and ecological threat to valuable and vulnerable fish stocks. Fish disease experts from Indonesia, Malaysia, the Philippines, Singapore and Thailand met to discuss strategies to control, through appropriate quarantine measures, fish diseases and pests in the international trade in fish seed. This publication presents a summary of the workshop, along with country reports and recommendations.



## Leucaena research in the Asian-Pacific region: proceedings of a workshop held in Singapore, 23-26 November 1982.

IDRC-211e, 192 pages.

Because of *leucaena leucocephala*'s multiple uses — as forage, fuelwood, poles, green manure, among others — this fast-growing, nitrogen-fixing tree has been the subject of much research in the last decade. The results have clarified the capabilities of the plant as well as its limitations. This publication presents 30 papers on leucaena from researchers in the Asian-Pacific region.

## Educational financing in developing countries: research findings and contemporary issues.

Ernesto Schiefelbein, IDRC-TS38e, 168 pages.

This study focuses on available research findings related to contemporary issues of educational financing in developing countries and presents a research review and an "issues" review. Topics discussed include: financial mechanisms as policy instruments; financing for efficiency, equity, and diversity in education; and evaluations of resources, financial processes and outcomes. Also available in French.

## Basic housing: policies for urban sites, services, and shelter in developing countries. Aprodicio A. Laquian, IDRC-208e, 163 pages.

"This monograph," says the author, "is about actual experiences in the formulation and

implementation of basic housing policies to improve the living conditions of the urban poor. It is aimed primarily at policymakers and administrators, although it may interest researchers and others as well." The work is based, for the most part, on four country studies (El Salvador, the Philippines, Senegal and Zambia) supported by IDRC and the World Bank that evaluated community-upgrading and sites-and-services programs.

## To order IDRC publications


Copies of publications described here are available free to libraries, universities, institutes, and researchers in developing countries. Requests from Africa, Asia, and Latin America should be addressed to the nearest IDRC regional office (see page 3 for addresses). Use the official letterhead of your institution. A brief description of your research and development activities will aid IDRC in answering your request. Requests from developed countries are assessed modest charges. Please order directly from the appropriate sales agent:

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**Opium:  
breaking an economic  
dependency ...  
page 16.**



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activities. A catalogue of currently available material is available on request.

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# Reports

THE  
IDRC

CAI  
EA 150  
- 126

**A world in cities**

- forest weather
- rural university





# LETTERS

## Feedback on radio

We were very pleased to see that the Developing Countries Farm Radio Network (DCFRN) was included in the article "The medium is the people" [*Reports* 12(1) April 1983] as an example of an innovative use of communications technology.

There were, however, a few points in the article which demand some clarification. It is stated that the material is " 'broadcast' rather than 'communicated', as there is no direct feedback mechanism built into the project." In reality, a system of feedback operates at two levels within the program.

The DCFRN participants are asked to evaluate each tape package by completing an accompanying information poll. From an analysis of responses we determine which items are useful, and what themes we should address in future packages. We also ask them about the nature of farming in their area, their other information sources, use of the material provided, and so on.

Not all participants are broadcasters — many are extension workers, journalists, teachers, or missionaries. Some of the broadcasters are extension workers as well, and most are in close touch with their rural audience. This is where the second level of feedback operates — between the rural communicator and the community that he or she serves. We try to tap into this feedback system by asking participants to tell us the reaction of their farmers to DCFRN topics.

In order to promote this

two-way flow of information we publish a newsletter for participants which includes articles on their innovative uses of DCFRN material, letters and comments from participants, requests for information, news of their activities, and photographs.

We believe that feedback is essential for DCFRN to make any impact on Third World agriculture. Input from the 500 participants ensures that the Developing Countries Farm Radio Network addresses the needs of Third World rural communities.

Helen Aitkin  
Project Manager, DCFRN  
Toronto, Canada

## Taxing tobacco

In her article "Up in smoke" [*Reports* 12(2) July 1983], Rhonda Birenbaum gives a good presentation of the current battle lines being drawn up between the tobacco industry and health professions concerned about the smoking epidemic throughout the world. It is an unfortunate thing that many countries throughout the world do not recognize that the health of their people is a greater natural resource than taxes, duties, and other charges that are obtained from the production of tobacco.

It seems to me that one of the best ways to overcome the tremendous weight of mortality and morbidity caused by the use of tobacco would be for governments and government agencies in the western world to provide grants to developing countries for large-scale public health education to give to all of the populace the information about the

terrible effects of tobacco on the human body. Second, and perhaps more important in terms of the control of the spread of this epidemic, would be for governments in the western world to make tax and importation restrictions on tobacco that would make it unprofitable for developing countries to produce tobacco. I realize that there are powerful lobbies that would oppose what I am saying. However, I feel it is time we speak out for what we consider to be the greatest natural resource of any country: its people.

Dr Tom Shepherd  
Director,  
Health Department  
Adventist Health Services  
Blantyre, Malawi

## River blindness

I was interested to read the brief article in *Explore* [12(2) July 1983] on the onchocerciasis ("river blindness") control program to which Canada is a substantial contributor. Indeed, the results have been encouraging and the program has been successful — even if major challenges still face us.

However, I would like to bring the following points to your attention. Although the article says 65 percent of the target areas of the program are "free" of the disease, it would be more correct to speak of areas where the transmission of the disease by blackflies has been interrupted. As the adult parasite can live between 10 and 20 years in the human organism, there will be people suffering from the disease for some time yet. In fact, these people constitute a reservoir of parasites that could lead to a new

outbreak of the disease (there will always be blackflies), if the vector control efforts were to be interrupted too soon.

The brief also refers to a World Bank report in saying that "no new cases of blindness" have been reported. This may be a rash statement. The World Bank document probably indicated that in a certain number of villages, where epidemiological evaluations were done, no new case of blindness had been reported. Even though this is a good indication of the success of the onchocerciasis control program, it is not possible to say that in the hundreds of villages located in the area in question, the number of new cases of blindness (due to onchocerciasis or to other causes) is zero.

Elizabeth Racicot  
Head, Health and  
Population Francophone  
and Commonwealth  
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United Nations Programs  
Canadian International  
Development Agency  
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Ottawa, Canada

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports, P.O. Box 8500, Ottawa, Canada K1G 3H9.*



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRD! Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Rowan Shirkie. *Associate Editors* French edition: Jacques Dupont; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee

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**Cover photo:** Tegucigalpa, Honduras. The ideal city of clean white highrises contrasts sharply with the realities of poverty surrounding it. Urban concerns are drawing greater attention in developing countries as more and more people move to the city. See stories beginning page 4.

Photo: François Bélisle



# A WORLD

*A rapidly urbanizing Third World presents new challenges to development*

YUE-MAN YEUNG

**J**uanita is a vegetable vendor in Manila. She moved to the city from a rural *barrio* (village) ten years ago. Juanita and her husband work seven to nine hours a day to earn 5 pesos (less than CA\$1). The money goes quickly to support her family of five children. The family lives in one small rented room, part of a converted market building now partitioned to house about 100 people near the public market where she works. There is no toilet, bath, or water. The residents use toilets in the market, and drinking water is some 20 metres away. The family possesses the barest of essentials, but poverty does not quell their hopes for a better future that education for the children might bring.

Calcutta, founded in 1690, grew by successive waves of in-migration and natural increase to be the largest city in India. Over nine million people live in a city built for 250 000. Calcutta is severely short of the basic facilities of drainage and sewerage, water supply, and housing. Garbage is dumped indiscriminately and collected irregularly. Over the last 50 years, the amount of filtered water available per person has dropped by over half. More than three-fourths of the city's population live in overcrowded tenement and *bustee* (slum) quarters. At least 100 000 people without any proper shelter live on the pavements.

Once a thriving trading and commercial centre, Calcutta has been stagnating and deteriorating, both economically and physically, in recent decades. It has acquired the dubious reputation of being the worst city in the world.

One urban dweller and one city, Juanita and Calcutta epitomize, each in their own way, the urban phenomenon that has been rapidly unfolding in many parts of the developing world since the end of the Second World War. Although Calcutta may be an example of extreme urban breakdown, there are many Juanitas and many Calcutta-like cities in the world. What is worse, their numbers continue to grow.

In 1970, there were 84 cities with populations in excess of 1 million in



*Although prisoners of poverty, the families in this low-cost housing project in the Philippines at least have adequate shelter. (The grill keeps children from falling.)*

the developed regions, compared with 72 in the developing regions. By the end of this century, it is projected that of the 425 "million" cities, 149 may be found in the developed countries, compared with 276 in the developing countries. Looked at differently, of the 30 largest cities in the world in 1970, 19 were situated in the Third World (14 in Asia). By 1990, 23 of the 30 largest cities will be in the less-developed countries; Asia alone will have 16. Among the "top ten" in 1990, the developed regions will be represented only by Tokyo and New York. All of these ten largest cities will be gargantuan urban agglomerations of many millions each.

The figures underline the fact that Third World urbanization has been rapidly accelerating. By the year 2000, more than half of the world's population will be living in urban areas, with a majority in developing countries. The implications for the provision of services and well-being of the millions of inhabitants of Third World cities are as serious as they are challenging, for policymakers in these countries, and for international development specialists alike.

## CRISIS AT HAND

Cities in developing countries have grown rapidly under circumstances quite different from those of developed countries. Urbanization in the Third World has not been accompanied by industrialization and the creation of

abundant job opportunities. The process has also been telescoped: the complex institutions that normally evolve over time to tackle increasingly demanding and complicated tasks have not appeared. Meanwhile, urban populations continue to grow by massive natural increase as well as incessant rural-urban migration. For the first time in history, Third World cities are confronted with enormous and seemingly intractable problems of huge populations, pervasive poverty, and limited resources. Urbanization in this environment is characterized by gross economic inefficiencies and social inequities, and an extraordinary imbalance between population and the demand for basic urban services. The litany of urban problems is now familiar to many administrators and researchers. The challenge is to find solutions within the financial, technological, and institutional constraints of these countries. An urban crisis is said to be at hand.

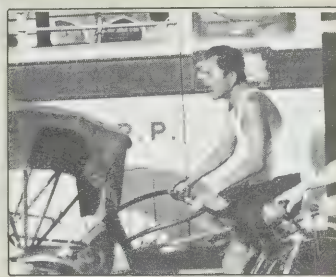
There are no tested solutions from developed countries that can be applied with efficacy to Third World urban problems. At the cost of time and lost opportunities, it has been discovered all too often that ready-made western formulas have not produced the expected results in Third World cities. The basic conditions are simply too different. Indigenous solutions, particularly of a low-cost type, will have to be found. Trial and error may often be



# IN CITIES



A handcart with household goods for sale in Lima, Peru: creating jobs and services.



(Top) Urban market in Ethiopia, and transport in Malaysia (above).

the method.

Despite unmistakable signals of mounting development problems in the early 1960s, the international assistance community refused to address head-on the issues associated with rapid Third World urbanization. Assistance programs of the United Nations system of organizations and private foundations had their emphasis squarely on the rural areas, or on development in specific sectors that may have included partial support for urban activities. It was not until 1972, when the World Bank began to provide development assistance directly to urban projects, that the international assistance climate appeared to take a more favourable turn. The urban projects supported by the World Bank stressed low-cost and effective means of delivering urban services and a broad application of results. They have measurably strengthened the management of urban growth. By the end of 1981, the World Bank had 62 projects in the fields of shelter, urban transport, integrated urban development, and regional development in different parts of the developing world at various stages of implementation.

Apart from the World Bank, the Asian Development Bank, the US Agency for International Development (USAID), the UN Centre for Human Settlements (Habitat), UNICEF, the International Labour Office (ILO), and the UN Environment Programme (UNEP), among others,

have been active in supporting infrastructure or social improvement of livelihoods in Third World cities. There is, however, a conspicuous need of *indigenous* research designed to seek better means or policies to cope with urban problems.

The IDRC tries to meet the demand for policy-relevant research in the Third World by encouraging indigenous specialists to study their own problems. Within the general concern for the welfare of the rural poor, IDRC has, since 1980, provided more support for urban research in developing countries. An Urban Policy Program within the Centre's Social Sciences Division actively works with Third World researchers in the design and implementation of urban projects.

Where the other assistance agencies have provided technical assistance and capital investment, IDRC has encouraged policy-relevant research. Projects synthesize existing knowledge of urban development policies, diagnose important urban problems and suggest solutions, or evaluate completed and on-going urban strategies and programs. A major focus of the program is on urban services — particularly in improving the delivery, access to, and effectiveness of, these services for the urban poor.

In order to assist developing countries to seek more practical solutions to their problems of shelter, IDRC has supported a number of studies in low-

cost housing. An eight-country study in Asia in the 1970s yielded useful data and information upon which existing housing policies were improved and new ones proposed. In addition to providing research data, the project promoted cooperation among participating agencies that continues well beyond the completion of the project.

A strain on urban services has caused some governments to extend basic services (water, sewerage, roads, electricity) to peripheral urban land in order to encourage squatters and slum dwellers in the city centre to move there and build their own housing through mutual and self-help efforts. In conjunction with the World Bank, IDRC supported a four-country study on the evaluation of "sites-and-services" projects to determine the extent to which the goals of the projects are being achieved, assess the impact of the project on the people living in them, and develop information that would help in the efficient execution of such projects in future, and help formulate policies within the cities and countries. It was a most worthwhile experience, for when the projects were launched in 1975, there was hardly any prior experience on which one could depend. It was a case of "learning by doing" for all concerned, and the research has yielded lessons and insights which are extremely useful for later projects to be developed (see "Up from scratch," page 8). More recently, in 1981, IDRC supported a seminar in Indonesia in which more recent approaches to low-cost housing provision in Asia were critically reviewed and compared. A recent publication, *A place to live*, highlighted some of these approaches.

## FOOD AND TRANSPORTATION

Support of research on food distribution and markets in urban areas began with a three-country, six-city study of hawkers and vendors in Southeast Asia. A comprehensive study of food markets in Mexico City followed (see "Feeding the city", page 13), and two similar projects are underway in Bangkok and Manila. These projects examine the role of food markets in the supply, dependability, and price of food for the poor. Other research in Egypt, Malaysia, India, and Zimbabwe will further define the problems of providing food in the city.

Low-cost transport is another sector of urban activities to which IDRC has lent research support. Not unlike similar projects IDRC supported in the 1970s, a four-country comparative study produced a wealth of data and



recommendations in Manila (Philippines), Yogyakarta and Bandung (Indonesia), Chiang Mai (Thailand), and Istanbul (Turkey), and has had a measure of success in galvanizing public attention and debate on ways to improve low-cost transport facilities within these cities (see the related story, "The claudos of Cameroon," page 7). Even more effectively, the recently completed study of *matatu* taxi-buses in Nairobi (Kenya), has been able to bring policymakers and *matatu* drivers together to discuss and evaluate research. Low-cost travel modes in Kathmandu (Nepal), Dhaka (Bangladesh), and Trivandrum (India), are

being investigated. At the core is a concern for the relationship of these diverse types of travel modes to the urban community, development plans, and the lives of the urban poor in these cities.

#### INSTITUTIONS

One key factor in the inability of many urban governments in developing countries to respond effectively to rapid urbanization is the lack of appropriate institutions. A network of five countries in Asia is about to complete their investigation of largely self-help mechanisms to deliver basic urban services. Researchers have been able

to show that, with the government's failure to provide minimum basic services for low-income populations, the inhabitants have been able to evolve rather effective low-cost mechanisms to meet at least some of their own most urgent needs.

The issues surrounding urban-regional relations, such as the role of cities in national and regional development, policies affecting urban growth and regional development, and the flow of capital, goods and services between city and countryside are real concerns for many Third World administrators and planners. Teams of researchers in Indonesia and the Philippines are trying to unravel the effects of circular and short-term migration of population on employment in medium-sized cities in the Sumatra and Mindanao regions of the two countries. Similarly, studies on the influence of medium and small towns on urban growth (in Nepal) and another seeking a more rational industrial and regional development pattern consistent with resource allocation (in Egypt) have recently been approved.

Urban change entails constant economic and social adaptation by individuals and households, especially the urban poor and recent in-migrants. Households exchange food and other goods so as to cope with exigencies as they arise. The theme of a study soon to be completed in Papua New Guinea examines how interhousehold transfers in urban areas have served vital redistributive ends.

In addition to these broad themes of support, the urban program has funded exploratory studies, such as those on urban waste management in Korea, central area revitalization in several cities in Latin America, and urban food and fuel in Kenya. New initiatives on possible studies on urban agriculture in Asian cities and on urban land policies and land needs in the South Pacific are being reviewed.

The urban projects supported to date are by no means exhaustive. Instead, they indicate the kinds of urban concerns that are considered to be most in need of research and policy guidelines.

As the present century comes to an end, the saliency of Third World urban problems and urban poverty will likely become more pronounced. If these problems are not to worsen, adequate resources must be made available within the international assistance community for work in the urban sector. Within this common goal of lessening, if not banishing, urban malaise in developing countries, IDRC's contribution will continue to help developing countries to seek innovative ways to come to grips with their ever-daunting problems. □

*Yue-Man Yeung is associate director, urban policies program, in IDRC's Social Sciences Division.*



*Low-cost housing in Caracas, Venezuela: supporting local solutions.*

## URBAN PROGRAM DIRECTIONS

The IDRC has supported 37 urban projects at the cost of over CA\$3 million since 1980. They are spread in all the developing regions.

Research projects are developed primarily by indigenous researchers, with program officers from IDRC playing an advisory role. Research projects are the property of recipient institutions, and although IDRC may be able to assist in a variety of ways to realize the research objectives and to disseminate the study results, it is largely up to the researchers to bring these to the attention of policymakers in their countries. It is for this and other reasons that the urban research priorities identified for IDRC support have been reached after dialogue with researchers in the developing world. They are built upon the conviction that it will be along these identified themes that IDRC can most effectively assist Third World institutions and researchers in their attempt to study the more overriding urban problems. The priorities are reviewed critically and continually and are in fact modified and strengthened as the program continues to expand.

In the immediate future, the Urban Policy Program will expand, both in staff and in the scope of activities. The bulk of support to developing

countries will continue to be research projects. Other means of support nonetheless will be actively pursued and encouraged. For instance, in the summer of 1983, through the International Geographical Union (IGU) Working Group on Urbanization in Developing Countries, a successful one-month training workshop was organized in Penang, Malaysia on the theme of Third World urbanization and the household economy. The primary objective was not only to advance research in the chosen theme of critical enquiry, but also to train a larger cadre of junior researchers who will be able to carry out independent research. A similar group training initiative is being discussed in Latin America. Besides supporting the IGU Working Group, the IDRC funds a network of human settlements researchers in central and southern Africa. Support is provided through the Mazingira Institute based in Nairobi, Kenya, which organizes regular meetings and publishes a newsletter.

Via IDRC's in-house publication facility, research findings are often published for the benefit of a larger audience. To date, at least 20 country and comparative monographs have been published.



# THE CLANDOS OF CAMEROON

ANTOINE AHANDA

**A**n original means of transportation made its appearance some ten years ago on the difficult roads in the rural areas of Cameroon. Converted Toyota, Mazda and Peugeot pickup trucks, originally designed for use as light utility vehicles, began to carry passengers. Commonly called "clandos" or "opeps," these pickups, often overloaded with as many as 20 passengers and their merchandise, now shuttle back and forth all day long between Yaoundé, the capital of Cameroon, and the villages within a radius of about 80 kilometres.

Until the early 1970s, public transit in Cameroon was provided exclusively by coaches that were privately owned but government regulated. The increased cost of fuel and vehicles in recent years led conventional carriers to abandon money-losing routes — such as those so close to town that fares were too low, or those that were so rough that wear and tear on vehicles was excessive.

The transportation vacuum was filled by increasing numbers of pickup trucks, called "clandos." Because a truck sells for only a little more than half the price of a coach or minibus, the owners can charge lower fares over the same distance. Today these trucks are a common sight in Cameroon, especially in Yaoundé.

Despite the high risk of accidents and the rapid wear and tear on the vehicles, clandos can still turn a profit. Few drivers actually own their vehicles — they rent them from entrepreneurs for a high price. Drivers work long hours, overload vehicles, and drive at top speed to make as many trips as possible in one day to make the clando pay off.

The attitude of the public authorities toward this unconventional form of transportation has changed over the years. Their original appearance was greeted with immediate opposition by the authorities. The pickups were outlawed because they were not equipped to carry passengers. But this did not stop the traffic, which continued in "clandestine" fashion — hence the name clandos.



*Spontaneous transport in Africa: the need for low-cost transportation has produced many innovations, and not a few problems.*

Their high speeds, even on the worst roads, drew the ire of local officials, and resulted in clandos also being referred to by another name, "opep," which can mean wind, speed, or the noise made by a vehicle running at full speed. According to estimates by the police and insurance companies, the clandos, often driven by unlicensed youths, have contributed to the sharp increase in traffic accidents in recent years.

Despite the dangers, clandos remain an important form of transport. Village workers and farmers from medium-sized towns within 80 kilometres of Yaoundé, a city of 500 000 people, usually must travel to the capital once a week to sell their produce, purchase goods, or run some errand. The rural people maintain that opeps are the only means of transporting their produce for sale. And the city-dwellers say the vehicles are their only way of visiting relatives in the rural areas on weekends.

The clandos have played an important role in the success of the "green belt" operation begun by the government to supply Yaoundé with foodstuffs. Crops that would otherwise rot in the villages are now brought into the city by these trucks.

The government has had to take these factors into account and its attitude towards the clandos is changing. The official goal now seems to be to incorporate the illicit vehicles into the Cameroonian transportation system, rather than banning them. In particular, the government is trying to get operators to obey safety regulations. Opeps now operate openly during the day and even pick up passengers at bus stations in areas neglected by regular carriers.

## OPEPS AND SILORS

The phenomenon of the opeps is similar to that of the low-cost transport available in Asia, the focus of a recent study supported by IDRC. The opep is most similar to the *silor*, a pickup truck adapted to carry passengers in Thailand. The only difference is that the opeps travel in rural areas, whereas the *silors* operate in the city.

The IDRC-supported study concluded that the *silor*, like the Philippine jeepney, Turkish dolmus-minibus and other low-cost transport systems, had evolved to meet an important social and economic need. The researchers in Asia recommended to municipal authorities that these systems be improved, rather than repressed. If such a suggestion were made now to Cameroonian officials, it no doubt would come with the unanimous support of thousands of riders who appreciate the daily service provided by the opeps in the rural areas of the country.

Although citizen groups have participated in the establishment of a public transit system in Cameroon, it has not developed as well as it might; it has not adapted to needs of many commuters. Nor is it possible any longer to tolerate the opeps in their present dangerous form. Their contribution to public transit should perhaps be studied and, if needed, regulated so that they may provide an organized, efficient and safe service to the many passengers who depend on them. □

*Antoine Ahanda is bureau chief of the Douala office of the Cameroon Tribune.*





A WORLD IN CITIES

# UP FROM SCRATCH

*The sites-and-services approach to housing in Senegal*

YORO SARR

**A** winding road, set amid sand dunes, stretches out under the leaden winter sun of Senegal. A bus shudders and stops with a grinding of gears. When the cloud of dust settles, what appears to be a huge maze-like construction site comes into view, extending as far as the eye can see. Roads, some asphalted, others just packed sand, are lined with neem trees. Stones and broken bricks lie everywhere. Here in Pikine-Guédiawaye,

just outside Dakar, a city is being born.

About 25 000 people now live here on 1837 plots covering roughly 350 hectares; an additional 2662 dwellings are being built. The whole site could eventually house well over 110 000 people.

The last obstacles to providing full services have been overcome. The main water supply has been installed in the three sections to be developed,

with the individual household plots in two of them already hooked up.

The first group of 41 tenants has been installed in the commercial district, and about 20 applicants have been selected to set up businesses in the arts and crafts area and the manufacturing and services zone. These people include builders, metalworkers, carpenters, weavers, repairers, merchants, shoemakers, bakers, butchers and druggists. Some small businesses and home crafts are officially prohibited but tolerated all the same: bread stalls, small shops, sales outlets for coal and building materials.

## CHOKING ON GROWTH

Senegal's urban dwellers, who make up almost a third of the country's people, are increasing in number at about six percent yearly. Two factors have touched off this accelerated growth: first, natural population growth in the urban centres, where most of the health and industrial infrastructures and services are concentrated; and second, the increasing drift toward the cities from the surrounding rural areas, where people can no longer make an adequate living.

The proliferation of shantytowns that absorbed urban growth threatened to gradually suffocate Dakar, the Senegalese capital. Facing up to this threat to economic and social development,



the Senegalese government adopted a policy of providing mass housing. It went into effect when the government started to develop Pikine-Guédiawaye for low-cost housing.

Traditional efforts to solve the housing problem by providing fully serviced houses have made little impact in developing countries because of limited resources and because low-income residents cannot afford such dwellings. As an alternative, many governments have chosen to extend basic services — water, sewerage, roads and electricity — to available urban land, usually on the periphery, and to encourage slum dwellers to move there and build their own homes.

Such "sites-and-services" schemes have not been entirely successful, however, because the housing site is often far from the resident's place of work and transportation is either unavailable or too expensive. To make the peripheral sites more acceptable, more housing is being provided and efforts made to locate sites close to job sources. Combinations of these approaches are now being introduced in several developing countries.

#### DEVELOPMENT OF URBAN RESEARCH

Although support for such innovative programs has been considerable, little is known about their actual effectiveness. As self-help is a relatively new concept among development planners (if not a new practice among the poor in developing countries), accumulated experience and research findings about it are sparse. It has thus been impossible to prepare convincing projections of socioeconomic effects on housing, incomes, health, etc.

The lack of data has led to an unprecedented program of monitoring and evaluation of early sites-and-services and area-upgrading projects financed by the World Bank, starting with projects in El Salvador, Senegal, and Zambia. The evaluation, jointly undertaken by IDRC's Social Sciences Division and the Bank, has sought to answer such questions as: How much housing resulted? Were the services supplied, and did the families respond by building or improving their homes? Were these families members of target groups that the country sought to assist in the first place? How efficient were the projects, and which components (water, sanitation, roads and paths, credit) made the greatest contributions? Were there discernible increases in employment and incomes? Did families sacrifice expenditures on other basic needs to improve their housing?

#### NEW CITY, NEW LIFE

For Daouda Mbow, a shoemaker and head of a family of 15, the sites-and-services settlement at Pikine-Guédiawaye is his salvation: "It's quiet and restful here and a good place for full-time work. Transportation is the

only problem left." In fact, it is obvious that the site is too isolated. Going from the new city to the capital is a major outing. The two bus lines serving the community are not adequate. The buses are often full, even before they leave the terminus in Pikine-Guédiawaye. The drivers frequently ignore stops at the site, especially at peak hours. The management of the local transportation company is aware of the situation, but responds that because of the limited population in the area, it would not pay to set up a new terminus. However, the company says it is trying to improve the two existing services by increasing the number of buses so as to reduce the waiting time.

The absence of playgrounds for children is another disappointment. They are planned, as are "green spaces," but have not yet been laid out. Says one father: "The children are depressed. Recreational facilities are al-

aged five and under, are being taught to prepare and store cereals properly, and mothers are being instructed in personal and child health care. In addition, talks are given on aspects of pregnancy and of prenatal and post-natal care.

One of the most crucial problems of the community has been partly resolved. Public security has been taken over by police, and a new station has been built in the area. Even so, thieves remain active — sometimes in broad daylight. Many housewives complain because their washing mysteriously disappears, often, they say, under the noses of the police. And since the time a thief was shot dead by the police, many plot dwellers have been afraid to venture out at night for fear of being mistaken for criminals.

One common complaint of housewives is the lack of price control. Bineta Ndiaye, a carpenter's wife and



*A maze-like construction site — the new city rises in Senegal. (Opposite) Self-help keeps building costs low at Pikine-Guédiawaye.*

most nonexistent — no cinema, no youth club. The cultural centre is built but not operating, we don't even have a post office."

There is another, more general reason for malaise and lack of services. The low level of occupation of the sites (only the first section is densely populated) has long held up a number of community services, such as schools.

Pikine-Guédiawaye shows healthy signs of life in some areas, though. A drug dispensary operates according to the national plan of "Health for all by the year 2000." The main association of plot owners granted the dispensary's management committee a medium-term loan for the initial purchase of drugs — about CA\$1400. To keep the dispensary in stock, the committee decided to sell "consulting tickets" — CA\$0.50 for adults, CA\$0.25 for children. A lack of supplies, however, remains a problem.

The community also has a nutrition and health program, made possible by gifts of cereals from the American Peace Corps. About 200 children,

mother of four, sees the cost of food as her biggest problem: "The merchants charge exorbitant prices here. They take advantage of the big markets being far away, and sell their food at the highest prices they can get."

This does not prevent other people from delivering a more positive assessment of the situation. Says Abdoulaye Diop, a taxi driver: "My family lived in really cramped conditions. But thank God today I pay seven times less rent for a space ten times as large. There's nothing like having your own property. No quarrelling with people I owe money to, no trouble when I entertain friends or relatives from our village. I still can't get used to it."

Although Senegal's housing program has been maturing for 12 years, the third and last installment of the World Bank urban development loan that financed the program was allocated only in July 1982.

The sites-and-services project was the product of the socioeconomic climate in Senegal of the early 1970s, a climate of rapid population growth,



intense migration from the land aggravated by drought, and overall economic crisis.

The capital city region of Dakar occupies only 0.28 percent of the land area of the country, yet in it are concentrated 65 percent of the nation's urban dwellers (or about 20 percent of the total population), 77 percent of the doctors, 75 percent of the pharmacists, 37 percent of primary school children, 32 percent of secondary school classes, nearly all the vocational schools, 44 percent of the public service, 80 percent of industrial firms, and 84 percent of industrial jobs.

This over-concentration was threatening to stifle development in other regions. Some people were aware of this as early as 1960, when the "Eco-chard Plan" aimed at eliminating squatter slums in the core of the city. Starting with the third Four-Year Plan for Economic and Social Development (1969-1973), Senegal adopted the sites-and-services approach to housing. Its objectives are to have families contribute to the financing of their own homes and to reduce public investment, while maintaining enough services to help improve the living conditions of the target population.

This approach should help the government cope with the intense demand for housing in Dakar. At present there are more than 25 000 names on the waiting list for public housing, with new applications numbering 3000 to 4000 each year. Yet Dakar's two public housing organizations have built less than 20 000 dwellings between them since their creation in 1952 and 1960, and only one in five Dakarians qualify for such accommodation.

It was with the signing of an agreement with the World Bank in 1972 that the sites-and-services project became operational. The cost was then estimated at CA\$8 million, to be shared by

Senegal (33 percent) and the World Bank (67 percent).

To promote the occupation of lots, the project's initiators encouraged people to build by stages, stressing development of the site without worrying about the type of construction. They also sought to bring people together under an umbrella association that was to fix a monthly savings rate for all members for the construction and purchase of accommodation.

Unfortunately, the system was often abused. A man with a family, a fishmonger, relates an example: "I have two wives and ten children. I applied in 1973, but I never had a visit from the financial investigators. And they never followed up any of the dozens of applications I made."

There were cases where tenants of another low-cost housing project owned sites-and-services plots as well. Irregularities went unquestioned. Some buyers, unable to build within the two-year limit of their loan agreement, simply sold out to richer people. These goings-on, together with the assignment of some larger, choice lots to well-off people appears to some visitors to the community to be a kind of "contempt of poverty."

#### SOCIAL JUSTICE

A five-room dwelling with kitchen and veranda costs about CA\$9000 in Pikine-Guédiawaye, repayable in monthly installments of CA\$90 over a period of 15 years. A three-room dwelling is evaluated at CA\$5200, repayable over 12 years in monthly installments of CA\$55. If one considers that the lowest monthly rent for a dwelling owned by one of the other public housing authorities is currently about CA\$120, the sites-and-services project would seem to be a good way to bring social justice to housing.

With a yearly inflation rate of 10 to 12

percent, however, it has been necessary to reassess the cost frequently. The price of a tonne of cement has gone up over 450 percent during the project. Ousmane Sogue, head of the Board for the Evaluation of Sites and Services (BEPA), the IDRC-supported investigating body, says that consequently "the levels of initial personal income (to qualify for purchase loans) had to be raised because of the difficulties in developing the area and in order to ensure the solvency of new plot owners, which is the sole guarantee that the area will remain viable."

Following the first two allocations of funds in August and November 1975, it ended up being necessary to assist buyers with construction. As a result, in October 1976, the World Bank released money to finance a first-construction credit program. Each buyer was allowed a start-up loan of about CA\$400, repayable at 7 percent interest within four years. Two years later, the problem was still as acute, and the available credit was more than doubled, then redoubled, in spite of BEPA objections.

Today, BEPA finds the project in dire financial straits due basically to administrative bottlenecks and slow repayment of loans. Over 88 percent of construction loan payments and approximately 30 percent of plot payments are overdue.

With loans too big to repay, the borrowers' have fallen into a sort of welfare malaise. And a recent BEPA survey showed that 90 percent of buyers are unaware of the risk they are running if they do not keep up their payments. The financial advisory activities for plot buyers, which were started in 1980 and proved their worth, have not been continued. The BEPA survey gives clear evidence of the defaulters' present plight: 83 percent of the average buyer's income is spent on food, water supply, electricity and transportation. The remaining 17 percent has to cover clothing, social and religious ceremonies (which are costly in Senegal), school supplies, medical care, loan repayments, etc.

IDRC's support of the project evaluation made it possible to set up BEPA and to analyze the project's development critically. It has also made it possible to carry out precise studies of specific problems with a view to putting the situation right in giving advice to executive bodies. But as Ousmane Sogue admits, "BEPA's advice is not always heeded."

But for all its apparent problems, the sites-and-services project at Pikine-Guédiawaye has proven itself and is due to be extended to the regional capitals. The main task now is to correct early mistakes and avoid repeating them in the project at Thiès, which is already underway, and in the Saint Louis, Kaolack and second Dakar projects, which are at the planning stage. □

*Yoro Sarr is a Senegalese journalist and a regular contributor to Afrique Nouvelle weekly.*

*Buses run through the development, but are often full before starting their routes.*





**U**rban problems take on particular importance in Latin America. Two-thirds of its population of some 400 million already live in urban areas, making it by far the most urbanized region of the Third World. By contrast, only a little more than one-quarter of the people in Asia and Africa live in urban areas. In fact, Latin America is as urbanized as more developed areas such as southern or eastern Europe, or even the Soviet Union.

Urbanization in Latin American countries has long been characterized by the "primate city"—the main city whose population is several times that of the next largest city. Although intermediate-size cities are growing rapidly in some countries, the pattern of one city dominating the social and economic landscape is not expected to decline significantly over the next two decades.

Thus, the number of large cities will continue to increase rapidly. For example, in 1950 there were only a half-dozen cities in Latin America with a population of over one million. By 1980, the number had grown to 25, and it is expected to rise to 46 by the year 2000.

Mexico City, with some 17 million inhabitants and a projected population of over 30 million by the turn of the century, is the largest urban agglomeration the world has ever witnessed. Sao Paulo, Buenos Aires, and Rio de Janeiro already have over ten million inhabitants each, and Bogota is expected to exceed that figure by the turn of the century.

While the total population of Latin America increases at an annual rate of 2.3 percent, the cities generally grow by more than 3 or 4 percent. This is the result of massive migration from rural to urban areas. In fact, in some cities, over half of the adult population consists of recent migrants from the countryside.

Most migrants are young adults with higher education levels than non-migrants; they come to the city in search of better economic opportunities. In the rural areas, opportunities are severely limited by unequal land ownership, the vast majority of the land being concentrated in the hands of a small number of very wealthy families. Moreover, agricultural productivity and incomes are low and population growth is rapidly increasing pressure on available land. Environmental degradation is the result in

many areas. Many rural people, therefore, move to the cities in the hope of finding better livelihoods.

To the rural migrants, urban life means quite a change in lifestyle. The forms of livelihood are different from what they were in the countryside. Jobs tend to be more specialized and often require skills that the migrant needs to develop. Economic interdependence is high, as households no longer are in a position to produce as much of what they consume. Exchanges of goods and services are

more frequently based on money than in rural areas. In short, new social, economic, and political characteristics evolve as urbanization advances.

On the average, urban dwellers in Latin America have higher incomes than people in rural areas. They also have better access to education and health facilities and to improved and more diversified services, such as water and electricity. They enjoy a much wider range of work, recreation, and social interaction opportunities. Like other Third World cities, however,



Sao Paulo, Brazil

## A WORLD IN CITIES

# BUILDING ON PEOPLE

*In search of urban solutions in Latin America*



Latin American cities do host a number of problems, such as massive slums, high unemployment, transportation congestion, rapidly increasing land prices resulting from diminishing land availability, high pollution levels, and crime.

### ONE CITY, MANY CITIES

One example of a problem-ridden city is Lima, Peru. Its population increased from 600 000 in 1940 to over 5 million today. Lima concentrates one-quarter of the nation's population but over half the GNP, three-fifths of the industrial firms, and three-quarters of the bank deposits. In spite of this concentration of economic activity, the state of the city's housing and service infrastructure is deplorable, and there are growing numbers of people living in conditions of abject poverty. Over one-third of the city's population lives in some 400 *pueblos jóvenes*, or recent low-income settlements on the outer urban rim. Only half the households in the *pueblos jóvenes* have water and

electricity indoors: schools are very few, hospitals non-existent. The slums of straw huts have spread everywhere on the barren, sandy ground and up on the rocky hills surrounding the city. Public transportation is grossly inadequate, but so is the road infrastructure. Accumulated garbage in many residential areas poses a health threat. Pollution levels are quite high, and crime is widespread.

Latin America is often considered a relatively homogeneous continent, in large part because of a common colonial heritage and the predominance of two languages, Spanish and Portuguese. In terms of urbanization, however, there is little similarity among countries.

There is wide variation in urbanization levels, pace, and patterns. Urban population varies from less than one-third of the total population in poorer countries such as Haiti, to over four-fifths in economically more advanced countries such as those of the Southern Cone — Argentina, Chile, and Uruguay.

Generally, the higher the level of urbanization, the lower the rate of urban population growth. There are notable exceptions, such as Venezuela, which has very high levels of both urbanization and urban population growth. Urbanization patterns also vary considerably from country to country. For example, whereas most countries are dominated by primate cities, others, such as Brazil and Colombia, have well-developed urban systems comprising several large and intermediate cities.

This diversity in urbanization throughout Latin America suggests both that the importance and nature of urban problems vary according to the national context of development, and that the research subjects and methods necessary to provide solutions to these problems accordingly should be diverse. □

*François Bélisle is a program officer in the urban policies program of IDRC's Social Sciences Division.*

## IDRC IN THE STREETS

To help solve urban problems, IDRC's Urban Policy Program has funded more than a dozen projects in 11 Latin American countries in the last two years. These projects range from CA\$20 000 to \$180 000, and total over \$1 million. They are carried out in university faculties and research institutes, in private research centres, and in government institutions. Below are some examples.

**Housing.** Massive slums, particularly at the periphery of the cities, are a widespread phenomenon in Latin America as in the rest of the Third World. Research is needed in order to design appropriate housing solutions and evaluate the effectiveness of government efforts to provide low-cost housing. In this context, the Centre has supported a recently completed study on the relationship between the urban land market and housing in low-income areas of the Quito metropolitan area. The project described the role of state and private actors and suggested ways of improving the availability of urban land for the poor. The Centre is also currently supporting an evaluation of housing policies in Asunción, Paraguay, covering the past two decades, and other projects on housing are being discussed for possible funding in Brazil, Ecuador, and Jamaica.

**Urban services.** Urban services are generally inadequate in large and small cities alike. In Monteria, a secondary urban centre in Colombia, IDRC is supporting work to

examine the provision of six services — water, sewerage, electricity, roads, sanitation, and housing. The project will evaluate the services needed over the next several years to accommodate in Monteria the influx of rural people displaced by the damming of the upper Sinu River.

**Urban development policies.** Several Latin American countries have devised strategies to attempt to spread urban growth to relieve the accelerated growth of the largest cities. It is not clear, however, whether such strategies work. The effects of government policies and programs on urban growth is the subject of an IDRC-supported study in Colombia.

**Evaluation of social programs.** Latin American cities are characterized by enormous social disparities. For some years, various levels of government have designed and implemented a wide range of programs to improve the standards of living of their low-income population. Yet these programs have often not been evaluated thoroughly. Evaluating the efficiency of the public programs aimed to improve the living conditions of the low-income population of Recife in Northeast Brazil is one way IDRC is supporting these efforts.

**Informal sector.** The "informal sector" consists of a wide range of economic activities characterized by low productivity, rudimentary methods of production, a high ratio of labour to value of production, and small amounts of capital investment — and consequently, low income for those who work in them. Such activities usually are outside the modern or "formal" labour market, which is unable to

absorb entirely the rapidly growing labour force. Informal activities may not be registered or supervised by the government. The vast majority of workers in them are not eligible for social security and other government benefits, and are not organized into cooperatives or protected by labour unions.

The informal sector in Latin American cities provides a livelihood for a large part of the population. In spite of its importance, the informal sector remains largely an enigma to Latin American social scientists and policymakers. This is why IDRC is supporting a five-project network on various aspects of the informal sector in Colombia, Costa Rica, Ecuador, Honduras, and Peru.

**Inner-city revitalization.** The deterioration of inner-city districts affects a number of cities in Latin America, as attested by the high incidence of social and environmental problems in these areas. Yet there has been very little research on ways to revitalize these areas and increase community participation in programs aimed at their rehabilitation. One IDRC project on inner-city revitalization in three cities of the Southern Cone is now under way. It involves multidisciplinary teams from two provincial institutions in Argentina and one in Montevideo, Uruguay.

**Food markets.** In addition to employment and housing and related services, access to food is one of the most basic needs of the urban poor. As the study of Mexico City's food system comes to an end (see page 13), two other projects on food and the low-income population are under discussion in Bolivia and Chile.



## URBAN FOOD SYSTEMS, MEXICO CITY

## FEEDING THE CITY

CHLOE MCKINNEY

**F**or Daniel and Rosa Fernandez of Mexico City, providing for their family of four has always been a struggle. Their country's "economic crisis" means higher prices for their basic needs, but they say they have never expected survival to be easy.

Their growing monthly food costs, 10 000 pesos (or about 85 Canadian dollars), leave little over from Daniel's minimum salary of 16 000 pesos (about CA\$135) as a factory worker. Fortunately for them, Rosa recently found work doing laundry four days a week at 350 pesos (about CA\$3) a day and their eldest son, Juan, still at school, works in the afternoon helping out with odd jobs at a local clinic. "He can pay for all his expenses now," his mother says proudly.

Several mornings a week, Rosa takes advantage of the subsidized prices for basic food at the nearest CONASUPO outlet (Compania Nacional de Subsistencias Populares). Before going to work, she lines up at six in the morning to buy milk, beans, rice, noodles, coffee, sugar and cooking oil. Although even CONASUPO prices are rising — oil by 300 percent in the last year — Rosa says they are cheaper than her local store, which she uses "only in an emergency."

Once a week, Rosa sets off on the four-hour round trip to a new market in Atizapan on the city's northwestern outskirts. With the two youngest children to help her carry things, she tries to buy enough fruit and vegetables to last the week. If there is money left over she buys eggs, red meat, or chicken as well.

Sometimes, when she is able to, Rosa invests in a piglet that she raises on scraps for a few months — not for the family's own food, but to sell to a meat buyer for profit.

Compared with others who live in their working class district, or to the estimated three and a half million living in the city's "colonias perdidas" or slums, the Fernandez family is well-off. Daniel's job seems secure. So far they have managed to pay for the books and paper required at their children's "free" school. And apart from regular and expected bouts of gastrointestinal infections they have not had any major illnesses.

In its concern over how well families such as the Fernandez's were managing to feed themselves,



*Mexico City food market: Caught in the economic squeeze, the urban poor are forced to spend a large part of their income just on food. Many are malnourished.*

the Mexican government launched an ambitious farm and food program in 1980. Known as SAM (Sistema Alimentario Mexicano, or Mexican Food System) the program was based on a comprehensive food profile completed in 1979. Results indicated that, in a population of 67 million, 35 million were undernourished and 18 million seriously malnourished. Of the latter, 6 million lived in urban areas.

Because of its size, holding a quarter of the country's population, high priority was given to analyzing the food system of Mexico City. Following the completion of an econometric study,

SAM, with the help of IDRC, began a detailed 18-month socioeconomic study in January of 1982. The project focused on the groups involved in the flow of food supplies from wholesaler to consumer within the city, and paid particular attention to the urban poor.

"Urban food problems are rooted in the basic urban problems the federal district is facing," says Cynthia de Alcantara, leader of the project and author of several socioeconomic studies of Mexico's food system. "They are not new, but the economic difficulties of the last few



years have thrown them into sharper relief."

## MONOPOLY MARKETS

Mexico City has been a market centre since the time of the Aztecs. Transportation has always been a problem. But it is only in the last 30 or 35 years that the transport system, or lack of it, has approached chaos. At present, food supplies — not only for the city's 17 million inhabitants but also for the rest of central Mexico (the states of Mexico, Queretaro, Michoacan, Guanajuato and Jalisco) — are first concentrated in the federal district's market before being moved on. Until recently all the produce arrived at la Merced, the old warehouse, market, slum and red light district in downtown Mexico City. Because of its traffic snarls, inadequate storage and poor sanitation, successive governments over the decades planned to move the market to a better location. It was only at the end of 1982 that a giant new market, Central de Abastos or "Supply Centre," was opened in the eastern part of the city.

"In many ways what has happened is that the same old problems have just been shifted to another location," commented Hector Castillo, a sociologist with the urban food system study. He grew up in the Merced area himself, and is author of a book on its history.

The new market was, ironically, built on almost the last remaining agricultural land within the federal district. The cost of pumping concrete into the swampy soil to support the new market added enormously to its construction costs, 600 percent more than estimated, which have resulted in higher warehouse and, inevitably, retail prices. But the problem of concentration remains and, according to Mr Castillo, should have been avoided by decentralizing wholesale operations.

He believes, however, that such concentration was greatly in the interest of the traditionally powerful wholesale monopolies whose control keeps prices artificially high. In his estimation as much as 1000 percent can be added to the price between producer and consumer. His studies show that, although the government tried to free the new market for fair competition by limiting each wholesale company to one storage unit, the established monopolies easily saw their way around the limitation. Often, they purchased the extra space they sought in the name of different family members, "even newborn babies and dead grandfathers."

But the high prices resulting from construction costs and monopolistic practices have affected more than the domestic food budget. They have begun to alter the nutritional quality and even the safety of prepared food.

Owners of the city's many *fondas*, the small restaurants that serve inexpensive hot lunches to workers unable to eat at home, are under pressure to keep their prices affordable to their



*A street vendor sells boiled and roasted corn: convenient and cheap, but of uncertain quality.*

equally pressed clientele. Research carried out by urban anthropologist Carmen Bueno shows that the *fondas* have been keeping their prices within limits by lowering food quality. They have had to buy spoiled vegetables, which are cheaper, and substitute fillers, often potatoes, for meat. The meat that is used is often a low-cost uninspected product, part of the illegal trade to which Rosa Fernandez will eventually sell her home-grown pig.

If the test of an urban food system is safe and adequate nutrition, how well is Mexico City's system working? Not very well, according to Cynthia de Alcantara. With an estimated 80 percent of deaths in the under-five age bracket attributable to malnutrition or gastrointestinal infections, "It is clear that in Mexico one can die from eating as well as from not eating," she says. If a child has been weakened by years of inadequate diet, a gastroenteritic attack from contaminated food or insanitary food handling is often fatal.

Precise figures on how many Mexicans are suffering from poverty and malnutrition, or on how the numbers are changing, are not certain. Since 1940, seven different groups have produced 14 different estimates using eight different sets of criteria.

Cynthia de Alcantara, basing a 1970 estimate on families spending more than 65 percent of their income on food, put the figure (for that year) at 41 percent.

More recent figures from Mexico's National Institute of Nutrition indicate that although over a million of Mexico City's inhabitants fail to get the minimum nutritional requirement set by FAO of 2000 calories per day, conditions in rural Mexico are much worse: 90 percent of the rural population fail to get the minimum calorie requirement.

## A CONTINUING CONCERN

The SAM program, which initiated the food system study and for whom it was carried out, held great importance for President Lopez Portillo, whose term of office expired before the study was completed. Although Mexico's current president, Miguel de la Madrid, has

not reinstated SAM, there are signs that his government also gives high priority to resolving many of the problems pinpointed in the study.

"The food supply must continue to be one of the highest priorities in the government's programs... there is no doubt that all the country's people should share in a food supply that is assured, adequate and affordable," he said in a recent book outlining his strategies for addressing the country's problems.

In his government's National Development Plan, policies are outlined to ensure a stable supply of basic foodstuffs, controlled prices, and better nutrition. The policies being adopted to achieve these ends include providing basic producers with financial guarantees; supporting farmers' and fruit growers' associations through the storage, transport, and wholesale systems; reducing or reversing rural-to-urban migration through rural development and industrial decentralization programs; and developing a nutrition education program for the poor with emphasis on mother and child health.

Evidence that the government is putting its policies into effect came with a crackdown on market speculators in August last year. The pending sale of 250 warehouses in the Central de Abastos was cancelled on the grounds that the potential buyers did not represent growers or retailers' associations, but entrepreneurs and speculators. The warehouses will be sold only to bona fide farmers' and fruit growers' associations, local retailers, merchant organizations and consumer cooperatives.

In the meantime, private initiative has started to lead the way to decentralization of the city's market, a movement that Hector Castillo regards as an essential first step. Objecting to the high cost of warehouse space in the Central de Abastos, a group of wholesalers planned to open another market on the other side of the city in the northwest. The group was refused permission by a government that, understandably, preferred attracting business to its large and costly new market. Undeterred, the group joined forces with farmers and workers' unions and succeeded in opening a new market in Atizapan, in the metropolitan area and just beyond the federal district's boundary. The wholesale space is cheaper and the food prices are lower as well. "It was an unusual combination of forces that brought it about," comments Hector Castillo, "entrepreneurs, workers, and farmers all united. Karl Marx certainly wouldn't believe it could happen. But it works."

The new market gives hope that, if it can bring together the spontaneous efforts of the people most affected, and the leverage of government policy, Mexico may be able to move some of the obstacles in the path of an equitable, efficient food distribution system. □

*Chloe McKinney is a writer on urban topics based in Mexico City.*



# UNDER ONE ROOF

LIM JEE YUAN

## THE TRADITIONAL MALAY HOUSE

**M**alaysia, like most other developing countries, is faced with massive housing problems. About 40 percent of the population of Kuala Lumpur, the capital of Malaysia, live in slums and squatter settlements.

Profiteering and speculation in housing have pushed house prices beyond the means of most Malaysians. A 1982 analysis of the total market demand for housing in Kuala Lumpur revealed 40 percent was for housing stock for investment and speculation. The year before, half of all land converted for housing in Malaysia was held by speculators.

Even government low-cost housing schemes, which are considerably cheaper than houses in the open market because of subsidies and lower land costs, are beyond the means of most people. A study prepared for the Urban Development Authority found that the cheapest Malaysian public low-cost housing unit was beyond the means of at least 80 percent of the lower income group of the urban pop-

ulation — those in most need of affordable housing.

Conventional housing solutions have largely failed to house the majority in the Third World because they are too expensive, inappropriate, or tied to a market controlled by speculators. Traditional housing solutions, however, have continued to serve many in the Third World. Traditional houses are in many ways the antithesis of conventional modern houses: cheap to construct, making intensive use of labour rather than capital; adapted to the individual needs of the occupant; and

tending to emphasize use-values rather than market-values.

The traditional Malay house serves the housing needs of the majority of people living in rural areas of Malaysia. It was evolved by the Malays over the generations, and adapted to their own needs, culture, and environment.

Basically a timber house with a post and lintel structure raised on stilts, with wooden, bamboo, or thatched walls and a thatched roof, the house is designed to suit the tropical climate. Ventilation and solar-control devices, and low thermal capacity building materials are part of the building heritage. House construction is highly systematised, like a modern prefabrication system, but with a much higher degree of flexibility and variation. The house components are made on the ground and later assembled on the building site. A very sophisticated addition system, which allows the house to grow with the needs of the user, is an advantage for the poor because it allows them to invest and build gradually,





rather than shouldering one huge initial financial burden.

The traditional Malay housing process is highly autonomous, largely controlled by the user. Guided by building tradition and the village carpenter, the owner-builder designs a house that is uniquely suited to the family's socioeconomic and cultural situation. Not only does the traditional approach foster a better match of house to user, it keeps the cost down by eliminating the need for professional intermediaries such as architects or developers. Self-help and cooperative labour are the resources upon which the owner-builder relies.

#### THE HOUSE AND COMPOUND

The *kampung* (village) environment is generally cool and shady, with lots of

nate the need for separate living and sleeping quarters.

Interior spaces are defined, not by partitions or walls, but rather by changes in floor level; they may be respected or ignored, allowing the house to accommodate larger numbers of people than usual during, for example, feasts. Thus the traditional Malay house exhibits greater versatility and more efficient use of space than does the modern house, where spaces are limited to the specific use determined by furniture and partitions.

The traditional Malay house has, over the years, evolved a very efficient addition system that grows according to the needs of its users. The core unit, or the *ibu rumah*, is the basic living unit for the small or poor family. The kitchen and toilet are often located on the

lieve the stress created by high temperatures and humidity. Houses are randomly sited to ensure that the wind has relatively free passage through the community. Moreover, the velocity of wind increases with altitude and the traditional Malay house on stilts makes the most of this phenomenon. Again, to maximize ventilation, the house features many full-length windows at an appropriate body height. These windows can be left open most of the time thanks to large overhangs which, in addition to offering protection from the driving rain, exclude the open skies from view and reduce the glare.

For religious reasons, most traditional Malay houses are oriented to face Mecca (i.e. in an east-west direction). This orientation minimizes the number of areas exposed to direct solar radiation during the day and, hence, the heat gain in the building. Heat retention is minimized by the lightweight, natural construction materials that have a low thermal capacity and the interior remains cool due to the insulating capability of the *attap* (thatch) roof.

The traditional Malay house tends to be somewhat dark inside, which has the advantage of giving an impression of coolness; for practical purposes, however, the introduction of artificial lighting would be desirable.

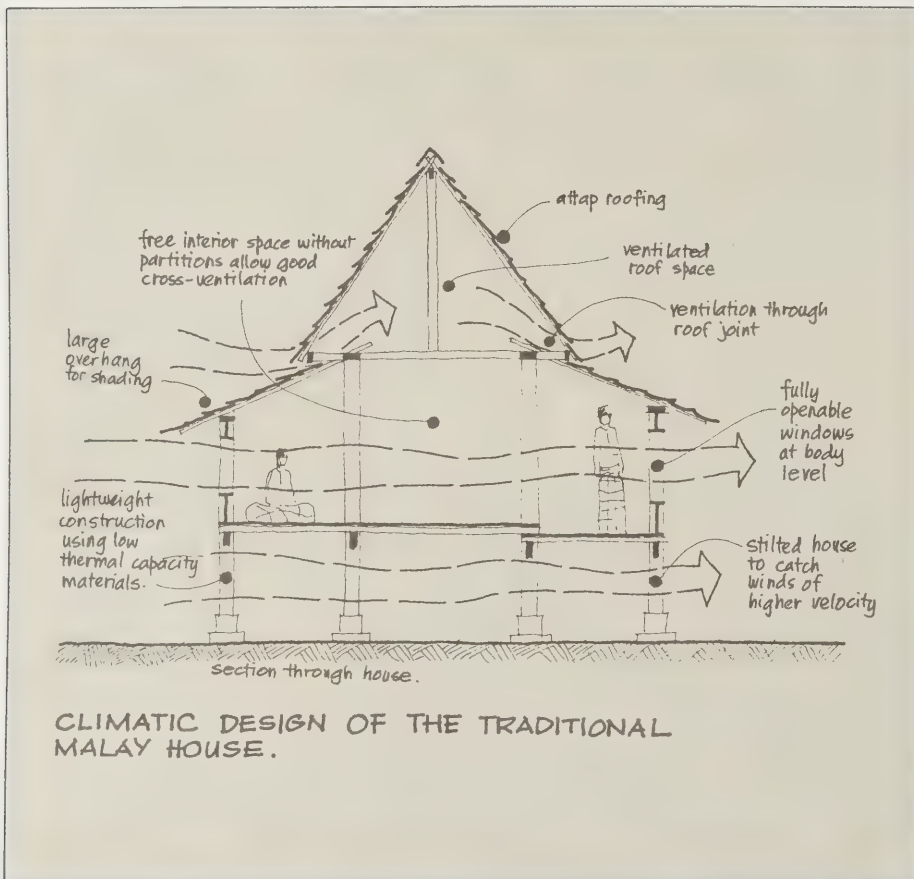
#### CONCLUSION AND LESSONS

One of the main reasons for the massive, unsolved housing problem in the developing countries is that solutions based on western prototypes have been applied to the problem of housing the poor — solutions that are inappropriate, expensive, and alienating, both physically and socially.

The traditional Malay house, on the other hand, demonstrates that the housing problem can be efficiently solved by the users themselves, provided they are given the necessary resources: land, finances, and the freedom to build. This may require appropriate government intervention, for example, to ensure that the people have land tenure security — or it may require the removal of inappropriate government intervention, as when new standards, rules, and bureaucracy take the decision-making rights from the people and give them to experts.

One solution to the problem of urban housing could be a prefabricated system that is based on the traditional Malay house — an approach that could lead to a more humane, socially and ecologically sound urban environment and one that fosters a strong sense of community. In so doing, we would be building on the positive aspects of our indigenous heritage, strengthening our cultural identity, and developing the confidence for a more self-directed and self-reliant development. □

Lim Jee Yuan is a researcher/writer at the Institut Masyarakat Berhad (Institute for Society) in Penang, Malaysia.



greenery. Paths are unpaved, and compounds are kept meticulously clean. Spaces flow into one another freely with few boundaries or obstructions. Unlike the roads of modern housing estates, which tend to segregate and disintegrate, the absence of physical barriers in the *kampung* allows a flexibility in accommodating individual needs that is not available under the imposed order of the modern housing estate.

The traditional Malay house has an open interior, promoting good cross-ventilation and lighting and allowing the space to be used for many purposes depending on the season, occasion, or time of day. Since most activities take place on the floor, the need for furniture is minimal; bedding materials and sleeping mats are rolled up and stored during the day to elimi-

terior. From the *ibu rumah*, many possible additions can be made as the family grows bigger or as it acquires the means to build a bigger house.

Additions are usually done in the spare time available during the agricultural or fishing off-seasons. Building a traditional house is a continual process, often taking months or even years to complete, with the pace of work and quality of construction controlled by the user.

The basic addition possibilities are classified into three different types, but there are infinite variations in sizes and heights, and various combinations of types and quality according to the needs of the user.

#### CLIMATIC ADAPTATION

The traditional Malay house features a number of adaptive devices to re-



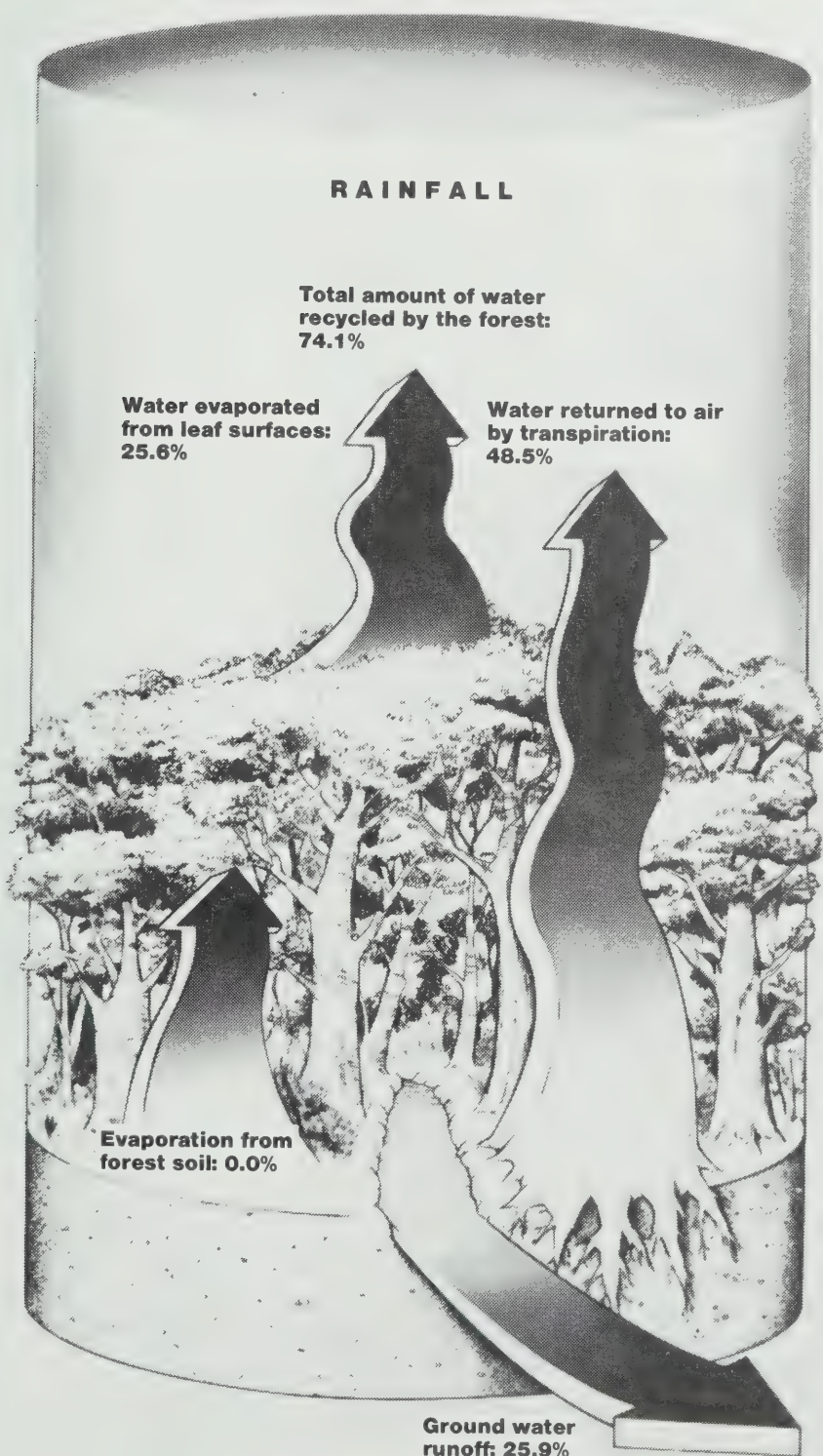
# FOREST WEATHER

BAYARD WEBSTER

## THE ROLE OF FORESTS IN GENERATING WEATHER



### How a Forest Recycles Water



**R**esearchers studying the dynamics of South America's tropical forest have produced scientific evidence showing with precision for the first time that a forest can return as much as 75 percent of the moisture it receives to the atmosphere. The finding indicates that the forest plays a much more important role in weather generation than had been previously believed.

The pioneering study, conducted in the world's largest forest in the Amazon River Basin, is also the first to show that the amount of water a forest gathers can be returned to the air in large enough amounts to form new rain clouds. Naturalists had long thought there was some relationship between forests and rainfall, but evidence for such a connection had largely been circumstantial or anecdotal.

The new research also indicated that land covered by trees collected and returned to the air at least 10 times as much moisture as bare, deforested land, and twice as much as land where grasses or plants other than trees predominated.

Other data gave evidence that water runoff is greatly increased without the heavy mass of vegetation to break the fall of rain, and that the rate at which water infiltrated the soil was considerably lower in compacted pasture soils than in other types. These two findings mean that most of the runoff from precipitation travels relatively far from the site and is not easily returned to the atmosphere. And the study also showed that removal of trees adjacent to rivers or their



tributaries contributed to greater runoff, rising levels of streams and flooding.

Many hydrologists had previously discounted the possibility that forest clearance or replacement by pasture or crops would have any major impact on amounts of rainfall, water balance, and flooding. The new findings were reported in a paper submitted to the American journal *Science* by Dr Eneas Salati, a professor of meteorology at the University of Sao Paulo in Brazil and head of the research team.

The study group, made up of forest ecologists, hydrologists, oceanographers, and others from South and North America, is credited with developing the most sophisticated study so far of the role played by forests and the atmosphere in relation to the hydrological and nutrient cycles.

Dr Salati believes that the findings could be helpful in land-use planning and forest protection programs in temperate and tropical forest zones. "I think we have shown that the water and energy balance — the life support system — of a land area depends on the kind of cover you have on the land," he said.

It is not yet known how the basic finding of the study, that a large forest can generate its own weather patterns, may be applied to forests in the temperate zone. Forests in varying geographical areas with different wind patterns, temperatures, soil composition and terrain, and affected by differing external forces, have correspondingly different internal water and nutrient dynamics.

## GLOBAL IMPLICATIONS

"The implications of this study for the rest of the world are that it clearly shows that natural vegetation must play an important role in the forming of weather patterns," Thomas E. Lovejoy, vice-president for science of the World Wildlife Fund, said in an interview. Dr Lovejoy is conducting a study of different kinds of ecosystems in the Amazon River Basin.

As tropical forests make up nearly one-half of the world's approximately 124 million square kilometres of wooded land, the results of the new research are expected to have significance for all scientists studying forest ecology, hydrology and energy balance.

"In other forests, the conditions may be different, but the underlying mechanisms shown in this study are the same all over and the implications for proper land use are not confined to the Amazon," said Dr Jeffrey Richey, a member of Dr Salati's team from the University of Washington in Seattle, U.S.A.

And although the study does not show that a large forest may influence weather and climate patterns far from the forest, many scientists think its ability to create clouds and rainfall may significantly affect global weather patterns. Such an effect could occur from changes in solar heat reflection caused by the formation of clouds above a forest. When clouds form, the temperature of the earth below them changes, a major factor in generating winds and weather.

By sampling air moisture along an east-west line across the Amazon Basin and measuring its changing composition in terms of oxygen isotopes, the scientists were able to determine how much moisture the forest recycled into the atmosphere. Samples of water vapour were collected on the ground and in the air from the Atlantic Ocean to the Andes mountains, 3200 kilometres to the west.

The researchers used as the basis of

who is also director of the Center for Nuclear Energy and Agriculture in Sao Paulo. He cited studies that showed that the forest near Manaus in Brazil recycled 75 percent of rain back into the atmosphere by evaporation and transpiration.

In that area, approximately 25 percent of the rain was diverted into stream runoff that transported the water far from the site. But another 25 percent was evaporated back into the atmosphere from raindrops that stayed on the leaves, and 50 percent was returned to the air above the forest by transpiration. In transpiration, moisture absorbed by tree roots from the soil is carried by the plant's vascular system back up to the leaves and exuded through their pores.

Other scientists, using different methods in other studies of the hydrology and climatology of the Amazonian forest, found that their separate investigations resulted in lines of evi-

dence that were similar to those obtained from the isotope research.

One of these studies compared yearly rainfall with the annual water discharge of the Amazon and other rivers. It showed that water discharged by rivers amounted to only 44 percent of annual rainfall, thus confirming the isotope studies that demonstrated that 50 percent or more of the rainfall was generated by the evaporation and transpiration processes of the forest.

These studies are credited with focusing the attention of scientists on the impact forested and nonforested land can have on hydro-

logical cycles and regional climatic patterns. And although few scientists can predict the impact of extensive forest destruction on global climate, Dr Salati and his colleagues state in their report that extensive forest loss in South America will undoubtedly cause major changes in weather patterns and agricultural practices in the Amazon Basin, an area of some 4.2 million square kilometres.

The United States Office of Technology Assessment and a Brazilian forest-monitoring program have recently independently estimated that about 6000 hectares of Amazonian forest are being leveled every day. Similar destruction is also occurring in the forests of Africa and Southeast Asia, forests that have hitherto occupied 50 percent of the existing land area in the 10 degrees of latitude north and south of the Equator. □

Photo: Jack Redden



*Logging in Peru. Extensive destruction of the forest environment will undoubtedly cause major changes in climate.*

their investigation the fact that the isotope oxygen 18 is found in known amounts in water vapour and rain clouds from the Atlantic. They knew that oxygen 18, one of the heaviest isotopes in water vapour molecules, falls preferentially to earth when it rains. Thus, in theory, as the prevailing winds from the east moved moist air westwards across Amazonia, rainfall along the way would greatly diminish the proportion of oxygen 18 as well as the water content of the moist air.

But they found by examination of the molecular composition of the air and water vapour at many sites along its 3200-kilometre route that the amounts of moisture and oxygen 18 remained fairly constant, indicating that the forest was recycling rain back into the atmosphere in large quantities. Over the entire range of the Amazonian forest, the amount of recycled rainwater averaged about 50 percent.

## RECYCLING MOISTURE

The most dramatic finding was reported by the team leader, Dr Salati,

Bayard Webster is a science writer for the New York Times, New York, U.S.A., ©1983 by the New York Times Company. Reprinted by permission.





Monsoon over Sri Lanka: a potentially devastating shift.

**E**l Niño is fading, say meteorologists. But for months to come people around the world will continue to suffer the floods and droughts linked to this awesome tropical weather phenomenon.

Each year, around the end of December, a large ocean current of warm water flowing southwards develops off the coast of Peru and Ecuador. The easterly trade-winds drag the warm surface water away from the continent, resulting in an upwelling of cold water, rich in nutrients, along the South American coast.

The local fishermen, who welcome this event and the sea of anchovies it brings to their nets, call it El Niño (the child), after the Christ child. Every few years, for reasons as yet unexplained, the easterly winds weaken. The surface water warms much more than normal and produces severe local and global consequences.

Scientists now use the name El Niño to refer to these much warmer episodes, even though it has become apparent that these anomalies, which occur about every four years, are quite different in their character and scope than the weaker annual events known to coastal fishermen in South America.

"The impact of the latest El Niño on the eastern Pacific has been the most disastrous event in the area in the last 50-100 years," says meteorologist Eugene Rasmusson of the U.S. National Weather Service. "The torrential rainfall in coastal Ecuador and northwestern Peru has smashed all previous records. Somewhere between 3600 and 3800 millimetres of rain fell." This is a phenomenal 100 percent increase over the normal rainfall at Guayacil, where the measurement was taken.

El Niño is an important element in the global climate system. The warm sea surface temperatures associated with it are linked to large-scale changes in the distribution of atmospheric pressure over the Pacific and Indian ocean region. The Southern Oscillation, as the seesaw of pressure difference between the east and west Pacific is called, accounts for a substantial part of the annual global variation in climate.

Usually, El Niño appears in the late winter or spring and peaks in the summer at a temperature of about 1 1/2°C warmer than the surrounding waters. The current El Niño began warming later, in mid-September of 1982, and continued warming through the winter months to reach a temperature difference of 7-8°C in June of 1983 along the coast. The influx of this much warmer water ruined the coastal anchovy fishery, which depends on the colder currents from deep offshore waters.

"Under normal conditions, this upwelling of cold, nu-

# EL NIÑO

## THE WINDS CHANGE

ANDREW WILLIAMS

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*An ocean current shifts  
the winds and global climate*

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trient-rich water from several hundred metres below the surface supports a rich fishery in the coastal area," says Dr Rasmusson. "The El Niño upsets this upwelling, introducing warmer, less nutrient-rich water, so the fish leave or go deep where the fishermen cannot reach them."

Peruvian officials have estimated that the 1982-1983 El Niño will result in a 50 percent decline in the 1983 catch, compared with that of the previous year. As the warm water spread away from the equator along the west coast of South Amer-

ica, the distribution of fish stocks changed significantly. There was evidence that indigenous fish stocks moved poleward along the Chilean and North American coasts in response to the warming of the tropical waters.

The impact of El Niño on weather systems was even more widespread. Regional climatic anomalies typical of previous warm episodes were repeated during the 1982-1983 event, but were unusually long and intense. In the eastern Pacific, Tahiti and Hawaii were struck by major cyclones during the winter, one of which was the most severe recorded in recent years.

The floods in the eastern Pacific were matched by the droughts in the Australian, Indonesian, and African regions. The nearly year-long drought that hit Australia in 1982 cut the production of wheat, oats, and barley to half of the previous year's harvest. One million people in Indonesia face famine due to massive crop losses, while southwestern Africa is experiencing one of its worst droughts this century, with severe water shortages and destruction of crops, livestock, and wildlife. The monsoons of southern India were also significantly weaker than usual as a result of the 1982-1983 El Niño.

It is the global impact of the El Niño anomaly that makes research into its causes and features so important. The 1982-1983 event prompted international cooperation among researchers and accumulation and sharing of data at an unprecedented rate. Plans are now being formulated for a major decade-long international research program to study the results of these investigations.

The effects of El Niño are worldwide, and the growing body of knowledge about its impact on global weather patterns will make a major contribution to short-term development programs in many countries.

As Dr Rasmussen points out, "Knowing the probability of below normal rainfall can lead to advanced contingency planning by governments in sectors that might be affected — water supply, food supplies, hydro-electric power." □

Andrew Williams is a freelance journalist specializing in development topics.



# LEUCAENA

## DELIVERING THE PROMISE

AMY CHOUINARD



**T**he words “don’t work in isolation” probably have special meaning for researchers at Ciawi, Indonesia. Contamination of their animal complex by local products was a key to solving one of the problems in using the tropical legume leucaena as forage.

Providing protein-rich forage for cattle and goats is just one of the many uses of this so-called miracle plant. Leucaena can also provide firewood, timber, posts, raw material for pulp and paper, and many other products within a relatively short period of growth. It can do all this while improving the properties of the soil — increasing nitrogen content, loosening compacted soils, and penetrating deep to bring nutrients to the surface. Its leaves are small and decompose rapidly — traits that make them ideal for soil amendment or green manure. The leguminous tree has been the subject of a number of IDRC-supported agroforestry, reforestation, and animal feed projects.

*Leucaena leucocephala*, generally referred to as leucaena, is one of 10 species within the genus. It is called *ipil-ipil* in the Philippines, *kao hoale* in Hawaii, and *lamtoro* in Indonesia. A fast-growing tree, leucaena usually begins to function as a legume within three months of being planted. Like other legumes, it acquires the capacity to take its nitrogen supply from the air when bacteria — rhizobia — in the soil infect its roots and form nodules. The resulting nitrogen compounds enrich the surrounding soil to the benefit of the leucaena and any nearby plants.

### PROBLEMS AND PROMISES

Despite all these qualities and all the promise they hold, leucaena has not been used as extensively as it might be in the tropics because of several problems associated with its use. One of these is the fact that animals feeding on leucaena lose their hair in a few weeks and suffer other toxic effects. The culprit is mimosine, a nonprotein amino acid that occurs in the seeds, shoot tips, and leaves of leucaena.

In ruminants such as cattle, mimosine is converted to a less toxic substance — 3,4-dihydropyridine (DHP) — and as long as no more than 30 percent of their feed is leucaena, they exhibit no health problems. If the quantity is increased, the DHP interferes with the thyroid’s ability to incorporate iodine. Goitres occur, with accompanying loss of weight, listlessness, and loss of appetite. But, as the researchers in Ciawi found, some goats and cattle harbour microorganisms that can completely degrade DHP. These microorganisms open the way, theoretically, for diets that are solely leucaena.

Efforts to solve the problem of



mimosine toxicity have focused on trying to breed a variety of leucaena low in mimosine content. Unfortunately, the mimosine content seems directly related to the vigour of the plant, and this relationship has stymied breeders.

Low-mimosine feed is more likely to be a product of processing techniques than breeding. Researchers working for the department of agriculture in Indonesia have evidence that an enzyme occurring in some of the cells that contain mimosine can cause the breakdown of the offending amino acid to the less toxic DHP. This enzyme comes in contact with the mimosine when the forage is chewed and, in ruminants, the breakdown of mimosine continues in the gut of the animal. The acid in nonruminant animals' stomachs denatures the enzyme and prevents further breakdown.

These findings may pave the way for production of protein-rich leaf meal with little or no mimosine content. For example, producers could chop the leaf meal to bring the enzyme into contact with the mimosine, and the product could be fed to nonruminants at higher levels than are currently possible.

While they were looking for a solution to the mimosine problem, researchers were confused by the conflicting reports of livestock reaction to leucaena feed in different areas. Dr Raymond Jones at the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia became convinced that these reports were not the result of sloppy research but rather of differences in the metabolism of the feed. In 1979 he monitored goats in Hawaii and found that DHP was being further broken down and that the leucaena feed was without toxic effects. He concluded that these animals, unlike the ones he had been testing in Australia, had microorganisms in their guts that metabolized the DHP.

In Indonesia, researchers had had reports that ruminants could tolerate high levels of leucaena, and they were attempting to find out why. Their first attempt was with four goats bred within the animal research complex at Ciawi and raised on a standard diet that did not include leucaena.

After a series of incidents in which livestock and leucaena from local villages were brought onto the complex for other purposes, the four goats developed the ability to break down DHP — possibly by gaining the "local" microbes through their feed or saliva left on it by the local stock.

"We have, thus, inadvertently and in a lamentably uncontrolled way, arrived at some indication of how easily the ability to detoxify leucaena might be acquired by, and transferred between animals when

the necessary microorganisms are in the surrounding environment," said J. Brian Lowry, one of the researchers in Indonesia.

Working with Lowry, Jones searched for the gut microbe allowing animals to tolerate DHP. The CSIRO announcement in February 1983 of the discovery and isolation of DHP-detoxifying microbes, and the fact that they could be cultured and transferred to goats and cattle, was the exciting culmination of this search.

#### TAKING ROOT

While leucaena does grow in a wide variety of soils, there are vast areas in developing countries where the climate is suitable for it but the soil is too acidic to support current strains of the plant. In acidic soils, aluminum forms complexes with calcium and makes it unavailable to *Leucaena leucocephala*. Calcium is necessary for good growth of the crop.

Calcium can be provided in a

on acidic soils. They have also been directed toward finding varieties with desirable characteristics and developing crosses that are superior in wood or forage production. From these efforts have emerged the Salvador giants. These trees can reach 20 metres high, and although they have only been studied for 10 years, their use is spreading rapidly. They often produce twice the biomass of the common, or Hawaiian, type. The Salvador types can more readily meet the need for a renewable source of fuelwood, as they are also faster growing. Peruvian-type leucaena produces more foliage for forage and green manure than does the Hawaiian variety.

There have also been renewed attempts to breed varieties that are low in mimosine content. The CSIRO has successfully developed a cross that contains less than half the normal content of mimosine.

Research must continue if leucaena is to achieve its potential. While it is a fast-growing plant once



(Left) The thyroid glands of a goat fed grass — no abnormalities; weight is 2-3 grams. (Right) Thyroid glands of a goat fed leucaena for 3 months — enlarged to 16 grams.



usable form by the application of dolomite, lime, or gypsum to the hole in which a leucaena seedling will be planted. This neutralizes the soil and enables the plant to become established, but in many places this is only a temporary solution. The taproot of the plant quickly penetrates the subsoil, and, if this layer is also acidic and aluminum-saturated, the plant ceases to grow.

One of the methods used to overcome this problem was the development of acid-resistant strains of leucaena. Workers at the International Centre for Tropical Agriculture (CIAT) in Cali, Colombia, have tested other species of leucaena to find acid-tolerant cultivars.

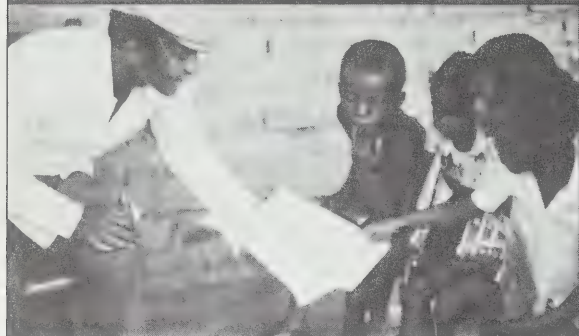
Breeding efforts have not been confined to the problem of producing leucaena that will survive

established, leucaena is a slow starter and, in competition with weeds, usually loses out in the early establishment stage. The poor growth of common species in acidic and aluminum-saturated soils remains a problem, as does its inability to grow above elevations of 500 metres in the tropics and subtropics.

The research priority of the coming years will be to expand the range of leucaena, so that it may finally deliver its enormous promise. □

Amy Chouinard, a technical editor in IDRC's Communications Division, attended a recent Centre-supported workshop in Singapore on leucaena research. The proceedings have been published as IDRC-211e, *Leucaena research in the Asian-Pacific region*.





# THE RURAL UNIVERSITY

**S**tretching from Cartago to Caloto inland along the Pacific coast, and surrounded by the Andes Mountains, the Cauca Valley of Colombia is a land of physical and social contrasts. Large tracts, given over to the cultivation of sugarcane and the other cash crops of agroindustry, lie sprawled like sleeping giants in a patchwork landscape of poor family farms, some no bigger than two or three hectares. Most of the people of Cauca are black, descendants of the slaves brought to the Colombian valleys in the 17th century to work on cattle farms and the sugar fields.

In recent decades, wealthy entrepreneurs have purchased much land from these small farmers to expand their sugarcane plantations. The shift in land tenure resulted in independent farmers and their children becoming dependent farm labourers — mostly low-paid sugarcane cutters with no job security. Due to the lack of opportunities and the great force of poverty, the people have become a transitory population in a state of constant but unsuccessful migration to the city.

Many farmers resisted the pressure to sell their land and today continue to eke out a meagre existence. The more economically

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GERRY TOOMEY

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stable ones are those with a *finca*, a kind of orchard where they grow coffee, cocoa, and plantain. Most families, however, have little land and few tools, and live in modest dwellings with no running water or latrines.

To those who think of universities primarily as urban institutions, the term “rural university” may seem self-contradictory. But not to the inhabitants of the Cauca Valley. For many of them, the FUNDAEC rural university, based in the village of la Arrobleda near Cali, is an agent of change, an institution in their midst that helps them use knowledge to improve their lives and livelihoods.

The Foundation for the Application and Teaching of the Sciences (FUNDAEC), was created in 1974 by a small group of professors from the Universidad del Valle, in Cali. The FUNDAEC philosophy holds that disadvantaged rural people can not only benefit from higher education but can also help create and exploit new technologies to improve their standard of living. This tenet, coupled with disappointment over the failure of national and international development efforts to

improve the well-being of the rural poor, led to a novel approach to education and development.

“Usually when one thinks of institutions working with peasants, they are not supposed to take a very high-powered approach intellectually,” says FUNDAEC director Dr. Farzam Arbab. “What is usually taken to the peasants is information, not knowledge. As far as I can tell, FUNDAEC is a rare kind of institution because we make the creation of knowledge the basic issue. A rural population needs a university, not just primary or technical schools, to act as its learning institution.”

The three levels of the FUNDAEC learning system are the “promoter” of rural well-being, the “technician,” and the “engineer.” FUNDAEC sees promoter training not as sufficient qualifications for a rural job, but as a basic education to be gradually offered to the entire youth population of the Norte del Cauca region. In this sense, promoters are the base of the pyramid of workers.

Promoters study in their own village under a tutorial system called Sistema de Aprendizaje Tutorial (SAT), run by FUNDAEC engineers in the last stages of their formal training. At present, this training is available in 20 villages of the Cauca Valley, with a total enrollment of about 200





*The rural university in Colombia links education with development. (Clockwise, from bottom opposite) Literacy training, improved stove design, and small enterprises create knowledge and income.*

students. Between 30 and 40 were expected to complete their training by September, 1983.

Although promoter training ideally lasts one year, students learn at their own pace and, once finished, their training is considered by the Ministry of Education to be the equivalent of two years of high school. The FUNDAEC administrators point out that the cost of training a promoter using SAT is about three-quarters that of sending the student to a regular high school for two years.

The SAT curriculum has five components: service to the community, mathematics, science, technology, and language. Service to the community is basically an exercise in getting to understand development at the family level. Students establish a personal dialogue with a number of families in the village, observing their problems as well as the opportunities and resources available to them. The students discuss their observations with other students to establish a clear picture of how the village operates. Subjects such as health, small industries, and marketing are studied throughout the course.

Students chosen to go on to the technician level continue their training in the same subjects for two years or more. But, academically, the level is

higher. This is considered the equivalent of a four-year high school program.

At this stage, the "service to the community" component is more complex, organized into "research-action-learning packages." For example, in a package dealing with environmental issues, the students and professors make a detailed analysis of the state of sanitation in a village and relate it to the health of its inhabitants. In another package, "small units of production," the students share a production project with a village family, such as a chicken-raising operation. Here they apply their technical skills and receive their first training in simple economics and community organization. Such projects are geared toward villagers who do not have access to much land.

The final three-year stage of training brings the student to the level of a university graduate, an engineer in rural well-being. The engineers-in-training tutor promoters, and continue both academic studies and joint production ventures with peasants, finishing with the one-year supervised residence in a village.

When students reach the engineer stage, they are intimately involved in the creation of knowledge. They identify specific needs in the community, search for, and experiment with, technological alternatives, and participate in the dissemination of solutions, mainly through technical bulletins and the university's documentation centre.

#### SUSTAINING DEVELOPMENT

What has worried FUNDAEC is whether these young professionals can find adequate sources of income once they graduate. More than a few small-scale production ventures with local farmers would be needed to make a living. To help solve the problem, an association of engineers has been created as a non-profit organization with capital of about CA\$240 000. The association will be an investor-partner in a number of large enterprises such as a plant for feed concentrate. Profits

## A STUDY OF STUDIES

The FUNDAEC rural university promotes an alternative agricultural principle for the small farmer — that of diversity to diminish the risk of crop and income loss.

IDRC's Agriculture, Food and Nutrition Sciences Division is supporting FUNDAEC's efforts to develop improved small farm production "sub-systems," such as better ways to grow maize and beans together. The research is based on a diversity of plant and animal species and better organization of farm work.

IDRC's Social Sciences Division is also supporting FUNDAEC by fund-

ing an assessment of its teaching strategies. Researchers hope to determine how effective the instructional materials are. They are also testing the knowledge and performance of the senior-level "engineers" who tutor the first-level "promoters" and work with farmers.

Another project objective is to observe and record the overall development of the FUNDAEC model, in both its educational and technological aspects. Such a description should prove useful in any attempt to replicate the FUNDAEC approach, or parts of it, elsewhere.

will not be divided among members but put into a fund administered by the association's elected board. The members will present proposals for village development and include their salaries in the budget.

"The engineers believe that 1983 and 1984 will witness the consolidation of their association," says Dr Arbab, "and that they are finally finding a reasonable answer to the question every visitor has asked them since the beginning of the program; 'How are you ever going to earn a living after you graduate?'"

FUNDAEC's professors feel the curriculum, especially the service to the community component, has engendered a strong sense of commitment among the new engineers for rural well-being. Not everyone has been so optimistic. "Many people made bets with me that none of them would be there after the first couple of years," recounts Dr Arbab. "It's turned out to be totally the opposite. I think we've broken the myth that getting an education automatically means leaving the rural areas."

While FUNDAEC goes on training promoters, technicians, and engineers, perfecting its curriculum, and finding technological solutions to villagers' problems, a nagging question remains. How far can people develop with such limited resources? Rural development where there is no land available to the farmers, says Dr Arbab, is meaningless.

The pattern of land tenure is unfavourable to the villagers of the region. But the correction of such a structural problem is beyond the ken of the rural university, which is non-political. Perhaps FUNDAEC's contribution to Colombia's development is that it is providing the people of the Cauca Valley a way of improving their daily lives, however modestly and slowly, without resorting to violence or revolution. □

*Gerry Toomey is a writer in IDRC's Communications Division.*



## BRIEFS

### Anaemic women

About half of all women in developing countries are estimated to be suffering from iron-deficiency anaemia, making it "one of the most frequently observed diseases in the world today," according to a recent World Health Organization (WHO) report.

Some 230 million out of 464 million women in developing countries are deficient in one or more essential nutrients — chiefly iron — and, less frequently, folate (part of the vitamin 'B' group essential to red blood cell production).

Pregnant women are more often anaemic, says the report. Two-thirds of pregnant women, as compared with about half non-pregnant women sampled, had indications of anaemia. The cause is put to the dramatic increase in nutrient requirements to provide for the needs of the fetus and placenta during pregnancy. "The need cannot be met by diet alone, but is derived at least partly from maternal reserves," the report says. "When these reserves are already low — from malnutrition or frequent pregnancies — anaemia results."

In Africa, 63 percent of pregnant and 40 percent of non-pregnant women are anaemic; in Asia, the proportions are 65 and 57 percent; in Latin America, 30 and 15 percent. Women of reproductive age are particularly at risk, due to nutrients lost in regular menstrual blood flows and to the increased nutrient demands during pregnancy. Anaemia is also caused, or aggravated by, parasitic diseases, notably intestinal parasites and

malaria — both widespread in developing countries.

Mild or moderate anaemia may impair well-being and the capacity to work. Severe anaemia produces appetite loss, fatigue, dizziness and a variety of other symptoms that interfere with normal functions.

"Because of its deleterious consequences, and because it is so widespread, nutritional anaemia in women must be given high priority," the report states. "Most nutritional anaemia can be prevented."

### Going to the mountain

Development in the mountainous Hindu Kush-Himalayan region presents planners with a dilemma. Development efforts must necessarily involve the exploitation of natural resources. Yet the fragility of the mountain ecosystem means any use must be scrupulously cautious.

The International Centre for Integrated Mountain Development (ICIMOD) was recently inaugurated to deal with the special development problems of the Hindu Kush-Himalayas. The inauguration was marked by an international symposium — Mountain development 2000: challenges and opportunities — held in Kathmandu, the capital of Nepal and ICIMOD's base.

The objective of the centre is to promote economically and environmentally sound development in the area which encompasses part or all of the mountain regions of Afghanistan, Bangladesh, Bhutan, Burma, China, India, Nepal and Pakistan.

The ecological balance of the Hindu Kush-Himalayan region is extremely vulnerable. The steep, unstable slopes are subjected to wide daily temperature differences. The western and central ranges are arid, whereas the east experiences the torrential rains of the summer monsoons.

Until the beginning of this century, a sparse population had little impact on the land and the delicate ecological balance was maintained. The increase in population since then has resulted in overgrazing, deforestation, and overuse of the mountain slopes.

The effects of this overuse have been far-ranging. The denuding of the upper slopes has resulted in soil impoverishment, soil erosion and landslides that have swept away houses and even whole villages. The lowlands as far away as Bangladesh have experienced silting, flooding, and devastation as the treeless upper slopes are no longer able to retain the monsoon rains.

The deteriorating conditions in the highlands and the lack of employment opportunities other than agriculture have led to migration to the lowlands and urban areas. The migration has produced serious housing and employment problems in the lowlands.

The problem transcends national boundaries, but cooperation is difficult in

areas characterized by ethnic, cultural, political, and linguistic differences. The Centre was founded by Unesco and the governments of Nepal, Switzerland, and the Federal Republic of Germany to provide the scientific information, expertise and training that may become the basis of joint action to solve the problems of development in the area.

Besides working with agencies in the Hindu Kush-Himalayas, ICIMOD will hold seminars and conferences that will further the discussion of integrated mountain development in other mountain areas in the world. ICIMOD, c/o SATA, Ekanta Kuna, GPO Box 3226, Kathmandu, Nepal.

### A plantain for all seasons

Plantain may soon be produced in the Ivory Coast all year long, instead of six months a year, as in the past.

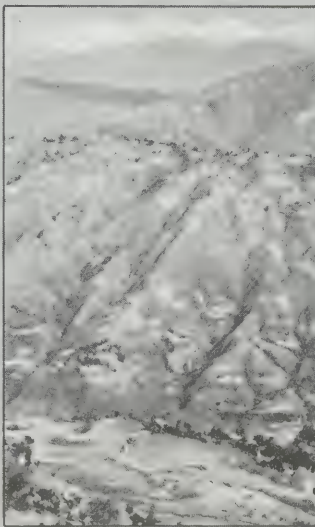
After rice, plantain is one of the Ivory Coast's most important staples. It is eaten in various forms: as *foutou* or *purée*; in fritters, when it is ripe; or braised. It differs from the *poyo* or "dessert" banana in quality, colour, and taste. Whereas a ripe banana is eaten raw, a ripe plantain must be cooked because it is more starchy than sweet.

A subsistence crop traditionally grown in forest zones, plantain has been the subject of various scientific research studies in the Ivory Coast during the past five years, primarily by the Fruit and Vegetable Research Institute (IRFA) in the capital of Abidjan.

According to Mr Sery, a researcher at the institute, producing plantain twelve months a year means that the shortfall in one of the Ivory Coast's basic foodstuffs may be overcome in part.

Cultivation of plantain in the Ivory Coast is a secondary activity for small farmers in the forest zone. Just as the cultivation of plantain varies from one region to the next, so does its consumption. The south, central, and eastern

The fragile mountains







*Plantain: new and improved*

regions are both the highest-producing and the highest-consuming areas.

The total production of plantain in the country was assessed at 830 000 tonnes in 1981. This compares with 700 000 tonnes grown in 1975. Crop losses are considerable: some 35 percent of the total amount produced. To fully meet national demand, Sery says, plantain growers must use both the highest-yielding varieties obtained by scientific research and improved production techniques. And both approaches should be complemented by research into the most successful marketing and preservation approaches. According to Sery, unless these last two sectors are improved, new agricultural methods will be only partially effective.

Past research on plantain has not met with particular success because of the priority placed on other crops for export purposes. However, since 1980, IRFA has selected and studied a number of banana strains; today it has in its collection more than 30 varieties with a known production potential. Research is continuing in the country and hopes are now pinned on a recently identified variety that is capable of withstanding the weather conditions of the Ivory Coast, enabling year-long cultivation of plantain. *Hien Solo*, *Fraternité-Matin*, *Abidjan*.

### Troubles with technology

What happens when a feasibility study for a cement plant in Africa is carried out in the dry season by a team of French experts, with little local involvement? The plant begins operations in the rainy season and the company realizes there is no equipment to dry wet limestone!

It happened in Benin — similar foul-ups occur all over Africa.

Relying on foreign research and technology can result in costly mistakes. Governments daily have to choose which technology to use in their projects. But with little understanding of technological issues and faced by articulate foreign experts who press the "best" answer,

governments often make choices that result in development failures.

"African governments," claims Ori Boizo, an Ivorian government researcher, "haven't yet realized that they must promote their own science and technology research and establish technology policies to control development."

Boizo and 17 other researchers from Francophone West Africa were attending an IDRC-supported workshop on

"Research on Technology Policy in Developing Countries," in Dakar, Senegal recently. One of their investigations turned up a French electrical company operating in Senegal since the 1930s that had still not trained Senegalese to manage operations.

"What must be changed," says Norman Girvan, workshop co-ordinator and consultant to the Science and Technology Policy Program of IDRC's Social Sciences Division, which sponsored the workshop, "is the idea that governments are powerless to alter this situation."

The current lack of control over technological decision-making results from several factors. First, transnational companies' management styles and licensing agreements prevent nationals from learning techniques. A local manufacturer may be given instructions on how to produce electrical parts, for example, but no explanation of the underlying technology. Girvan calls this "non-transfer" or "non-assimilation." Ironically, materials that could be provided or built locally are often supplied by the company.

"Contracts," emphasizes

Girvan, "must be negotiated by the host government in a different way."

Another reason for the lack of control over technology lies in the attitude of government officials themselves. A major complaint of workshop participants was that "governments don't take national research seriously." They are often more impressed by teams of foreign experts armed with an array of statistics and sometimes they even discount the findings and counsel of their own researchers.

The preference is more than intellectual.

Government officials benefit from foreign contracts and they are also reticent to provoke the transnationals with whose governments they maintain intimate relationships.

Researchers acknowledge that "being listened to" is an ambitious aim. But as Girvan remarked, "Even if governments aren't listening now, at least they should know what they're giving away."

*Lyse Doucet*  
*West Africa magazine,*  
*Dakar.*

### Fuel from waste

Small-scale briquetting of agricultural wastes could provide Third World villages with an economical source of fuel for household and industrial use, according to a report prepared for the Swedish International Development Agency. Indeed, it is estimated that the developing countries have an unexploited energy potential in agricultural and forest waste that greatly exceeds their current energy consumption.

Briquetting is a process whereby forest or agricultural wastes — such as rice husks, corn stalks, forestry residues, etc. — are dried, reduced to particles, and compressed into small, convenient pieces. The briquettes have a high thermal value and are excellent for all household purposes except lighting. Briquettes

*Jacques Faye, a Senegalese rural sociologist, leads a workshop on science and technology policy: regaining control of development decision-making.*





can be used to generate electricity by means of steam engines or gas producers. They can also be used to fuel such small industries as bakeries, brickworks, potteries, curing houses, breweries, and vegetable dryers.

Technically, the process of briquetting can be simplified to suit the needs and the resources of a given village. For example, raw materials can be sun dried, reduced by means of hand-powered crushing or milling equipment, bound by the addition of manure and ash, and pressed by a hand-operated or animal- or motor-driven press.

For further information: SCARAB Gärdesvägen 11, S-183 30 Täby, Sweden.

### **More weaned from bottle**

Since the World Health Assembly adopted the International Code on Marketing of Breast-Milk Substitutes in May 1981, more than 100 countries out of WHO's (World Health Organization) total membership of 160, have acted to give effect to its provisions.

Status reports written 12 and 18 months later by Dr Halfdan Mahler, who director-general, show that countries have either adopted a range of measures suitable to national needs, have enforced them through legislation, executive decree, or ministerial decision, or are in the process of so doing. The reports are based on information received from governments. (*World Health*)

### **Development directory**

A useful guide for agencies wishing to use the resources of Canadian universities for international development activities, the *Directory of Canadian University Resources for International Development* has recently been published by the International Development Office of the Association of Universities and Colleges of Canada (IDOC). 26

AUCC). The office was formed in 1978 to foster cooperation between Canadian universities and their Third World counterparts.

The directory lists academic disciplines related to international development, areas of specialization, research centres, international offices, experience in Third World activities, and the number of Third World students in university programs. A cross reference index is also provided.

A limited number of copies will be provided free to Canadian universities and various educational and development organizations in Canada and the Third World. Other individuals or agencies wishing to obtain a copy may purchase one from the Publications Office, Association of Universities and Colleges of Canada, 151 Slater Street, Ottawa, Ontario, Canada K1P 5N1.

### **Monkey disease**

Forest clearing in southwest India has resulted in a virus that normally attacks monkeys finding a new target — humans. Kyasanur Forest Disease, commonly called "monkey disease" because human epidemics are often preceded by monkey deaths, has affected 1000 people and killed 96.

The virus is transmitted by 16 different species of ticks that live on a wide variety of animals. When clearing began on the Nidale State Forest, the animals and their ticks migrated to forests near the six villages affected.

Although most mammals are unaffected by the virus, monkeys sicken and die. Humans experience high fever, pains, headaches, blood vomiting and nose bleeding. Ten percent of those infected die.

In the last 27 years, the virus has spread over an area of 4000 square kilometres of forest. And the Indian National Institute of Virology fears that with more forest clearing "monkey disease" will continue to

spread among the human population. (*New Scientist*)

### **Senegal's hidden treasure**

Spontaneous brush fires provided the clue. Contrary to all expectations, peat was discovered in Senegal in 1981.

Since then, the Senegalese government has been quick to adopt a policy for the development of its peat resources. Large quantities, more than 40 million cubic metres, have already been found in the Niayes hills north of Dakar, the capital. This alone could cut in half the heavy fuel imports used to produce electricity, and at the same time reduce the country's balance of payments deficit. It is estimated that the region's peat could supply a 60-megawatt thermal power station for 30 years.

Technicians have also been probing the banks of the Saloum River where there are indications of major mangrove-type peat deposits. Such peat would probably be found in lagoons, estuaries, or deltas in three zones of more than 1500 square kilometres each: the Senegal delta in the north, the Sine-Saloum and the Casamance in the south.

The Compagnie des tourbières du Sénégal (CTS) has been attempting to confirm the existence of these deposits. It has obtained a grant for this under IDRC's Cooperative Programs. With the 167 million francs CFA (about CA\$565 000), CTS will produce an inventory of peat zones with a potential for mining.

A Canadian engineering company, Cartier-Monenco, is working with CTS on the exploration, most of which they expect to complete by the end of 1983. With the help of computer-enhanced satellite photographs, they hope to detect peat deposits or at least the areas most likely to contain sizable deposits.

There are three main uses for the peat. The first is to fire boilers to generate electricity. Researchers are

attempting to determine the best combustion methods for Senegalese peat, which is drier than types found in northern countries.

A second major use for peat is in domestic energy, especially as cooking fuel. This could go a long way to helping conserve the forests of Senegal. Studies on domestic uses are already under way as part of the Niayes peat project.

Finally, peat can be used as a fertilizer for farmland to help slow soil degradation. Indeed, peat is a veritable trap for minerals. Sulphur, manganese and uranium, which enrich the soil, are often found in it. *Amadou Pame, Dakar*

### **Conservation for development register**

A register of international consultants in conservation and resource management has been established by the International Union for Conservation of Nature and Natural Resources (IUCN).

The *Conservation for development register* will list experts in the fields of natural resources management, environmental law and education, public health, agriculture, and other conservation and development-related disciplines.

The intention is to ensure that worldwide demand for experts in the many aspects of conservation is efficiently matched with the wealth of available international expertise, and that "the shortage of suitably qualified people ceases to be such an obstacle to achieving conservation goals," according to the IUCN.

A special effort is being made to locate as many consultants from the developing world as possible. Interested candidates may apply to: *Conservation for development register*: cdc/IUCN, World Conservation Centre, Ave. du Mont-Blanc, 1196 Gland, Switzerland; or JES/IIED, 1319 F Street NW, Suite 800, Washington DC 20004, U.S.A.



**SALUS: Low-cost rural health and manpower training: an annotated bibliography with special emphasis on developing countries, volume 10.** Rosanna M. Bechtel, editor. Published in September 1983, 148 pages, IDRC-216e.

This is the tenth volume of a series of bibliographies that compiles and coordinates information, both published and unpublished, on non-traditional health care delivery systems. Like its predecessors, the current volume focuses on new models of health care delivery and the training and deployment of health workers.

**SALUS: Low-cost rural health care and health manpower training: a cumulative index to volumes 1-10.** Rosanna M. Bechtel, editor. Published in September 1983, 150 pages, IDRC-217e.

This volume of the SALUS series contains the author, subject, and geographic indices for the first 10 volumes of the bibliography. The author listing includes corporate authors and editors as well as personal authors. An essential companion to the previous ten volumes.

**Pesca acompañante del camarón - un regalo del mar: informe de una consulta técnica sobre la utilización de la pesca acompañante del camarón celebrada en Georgetown, Guyana, 27-30 octubre 1981.** Published in November 1983, 175 pages, IDRC-163s.

This Spanish translation of IDRC-163e, *Fish by-*

*catch: report of a technical consultation on shrimp by-catch utilization*, will be of interest to policymakers, administrators, and all personnel involved in fisheries development. It presents background documents and delivered papers from an international consultation that reviewed experience in the recovery, processing, and marketing of fish by-catch in all the developing regions of the world. A list of participants and a bibliography are included.

## **Educational research environments in the developing world.**

Sheldon Shaeffer and John A. Nkinyangi, editors. Published November 1983, 288 pages, IDRC-213e.

Educational research takes place in a wide variety of circumstances and settings; from the antiseptic atmosphere and cool efficiency of the computer centre, to the stifling office where rows of clerks manually tabulate piles of data. But the economic differences are only the most obvious ones. Countries differ in their capacity to absorb research... or even to tolerate it. Research is seldom the neutral and benign process so often claimed by the scientific community or assumed by donor agencies.

In this book, a framework for understanding the unique characteristics of a given research environment has been applied to nine developing countries. Case studies illustrate the complexity of the educational research environment and suggest ways of enhancing it.

## **Le séchage des produits alimentaires: compte rendu du colloque tenu à Edmonton, Alberta du 6 au 9 juillet 1981.**

Gordon Yaciuk, editor. Published November 1983, 110 pages, IDRC-195f.

The price of fossil fuels is making the solar drying of food crops an increasingly important means of food preservation. Because of the diversity of crops and methods involved, IDRC and the Alberta Department of Agriculture (Canada) brought together researchers from different parts of the world and of different scientific disciplines to discuss drying requirements, consumer acceptance, heat and mass transfer, and heat sources. This publication — a translation of IDRC-195e, *Solar drying: proceedings of a workshop held in Edmonton, Alberta, 6-9 July 1981* — contains the papers presented at the meeting and a commentary by the meeting's technical coordinator. It should interest others in developing countries with similar concerns.

## **Systèmes de conférence informatique pour les pays en développement: compte rendu d'un séminaire tenu à Ottawa (Canada) du 26 au 30 octobre, 1981.**

Compiled and edited by David Balson, Robert Drysdale, and Bob Stanley. Published November 1983, 51 pages, IDRC-190f.

Computer-based conferencing systems appear to offer an effective tool for scientific

communication across geographic, language, and time barriers. This publication — a translation of IDRC-190e, *Computer-based conferencing systems for developing countries: report of a workshop held in Ottawa, Canada, 26-30 October 1981* — is the report of the meeting of an expert group convened by IDRC to discuss the opportunities and pitfalls such systems offer to developing countries.

## **To order IDRC publications**

Copies of publications described here are available free to libraries, universities, institutes, and researchers in developing countries. Requests from Africa, Asia, and Latin America should be addressed to the nearest IDRC regional office (see page 3 for addresses). Use the official letterhead of your institution. A brief description of your research and development activities will aid IDRC in answering your request. Requests from developed countries are assessed modest charges. Please order directly from the appropriate sales agent:

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In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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VOLUME 13, NUMBER 1 — APRIL 1984

# Reports

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## Crafts economies

- computer learning
- ethics in research
- promoting agriculture





# LETTERS

## Consult teachers

I was very interested to read the articles on education in the July 1983 issue of *Reports*. I would like to add to them my comments on education administration.

The complexity of bureaucracy in the school systems has weakened the fundamentals of the educational process. The educational process has three parts: a substantive dimension, which is the subject matter; a procedural dimension, which is methods and

principles; and an environmental dimension, which is related to the physical provisions available for learning.

Unfortunately, any suggested change, recommendation, or decision in any of these areas is just handed down a bureaucratic hierarchy. The implementation is up to the teacher. In most cases, the orders are unclear, the changes are not adaptable, and often the environment is not conducive to establishing the change.

Authorities must realize that teachers are the tools of their decision-making. Teachers must be involved in decision-making. They must be given an opportunity to give their opinions about recommendations and suggestions. They should be made aware of changes affecting the school and the student. The authorities may well come up with wonderful ideas, but if the teacher does not use them, the ideas will not be realized.

As the teacher faces a group of students in a classroom, he or she is alone. He or she can establish the respect of the students only by being organized, knowing the subject matter, providing learning activities, and genuinely caring for the students. The teacher can only build up this rapport and self-confidence if he or she is informed and involved.

Problems must be

diagnosed before decisions are made. Teachers are probably in the best position to diagnose and give suggestions, recommendations, and advice related to the needs of students as well as the community in which the school is located.

Teachers, given the opportunity to be involved in the decision-making process, will feel a part of the system and have greater confidence in accomplishing their duties. This cannot but benefit all those concerned.

Moses J. Leigh  
Annie Walsh Memorial  
School  
Freetown, Sierra Leone

*Letters from readers are welcomed, and should be addressed to:*

*Editors, IDRC Reports, P.O. Box 8500, Ottawa, Canada K1G 3H9.*

## Eminent Argentinian scientist dies

Jorge Sabato, the distinguished scientist and writer, died of cancer in Buenos Aires on November 15, 1983. Born in 1924, Sabato had three careers: First, as a physicist working with the Atomic Energy Authority of Argentina and establishing and directing the laboratories of the Institute of Technology until 1971. Second, he was an international consultant and teacher forced by circumstance and conscience to work principally outside Argentina, a country that he loved dearly and well. It was during this last period that he had a great deal of influence through his books and as an adviser to the Andean Pact, the OAS (Organization of American States) and a number of governments. Third, he was a writer and commentator, a profession that he had commenced early as a way of paying for his university studies and continued, with great

effect, to his last days.

Jorge Sabato's association with Canada and the IDRC were important during the last period of his life. He received a Senior Fellowship from the Centre, which resulted in an important book on the production of technology. He was a member, at the time of his death, of the Energy Research Group, an IDRC/UN sponsored project. For a number of years, he inspired students at the Université de Montréal where he taught as a visiting professor.

His achievements were never worn pompously nor heavily. He was against solemnity — just as he was against wearing ties — because he thought that people should enjoy what they were doing. He always spoke warmly and with a great sense of fun and wit to students, colleagues and his superiors (although those that knew him doubt there were any). He described himself as an intellectual because

in his view that name required him to be above all honest to ideas and to using those ideas for the good of all. He was against the "mediocracy," men and women who run organizations by routine and for power. During the last two years — when the censors permitted — he wrote about his ideas for Argentina in *Humor*, a magazine that exposed and ridiculed the actions of the two last dangerous years of the military regime. He died before the new civilian President could name him Minister of Technology. His death is a grievous blow to Argentina and Latin America.

He was and will remain an example to many people, who like his friends at the Centre, will miss him greatly.

A.D. Tillett  
Associate Director,  
Science and  
Technology Policy,  
Social Sciences  
Division, IDRC.

## Coming in the next issue

To come to a better understanding of the concerns of women in development — and how they can participate more fully in the development process — more effective and better defined research tools are needed. The next issue of *Reports* will focus on women in development.

Also in the July issue:

- the greening of the desert in Egypt;
- fishing moves inland in Sri Lanka with cageculture;
- the postpetroleum economy of Tunisia.





# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Rowan Shirkie. *Associate Editor*: Jacques Dupont. *Spanish edition*: Stella de Felerbaum. *Editorial assistant*: Hope Cadieux-Ledoux. *Staff photographers*: Neill McKee, Claude Dupuis.

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**Front cover:** Weaving on a hip-strap loom, Guatemala. Very small-scale industries such as crafts can preserve both culture and economies in the Third World. See story page 5.

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# WORKING ON DEVELOPMENT

## EMPLOYMENT PROSPECTS IN THE THIRD WORLD

**A**mid the hue and cry over the recent sharp rise in joblessness in the Western industrialised countries, little has been said about the growth of unemployment in developing countries. One reason for this may be that, at first glance, the rate of increase of unemployment in the Third World has been relatively low over the last two years. But, according to research recently completed by International Labour Office (ILO) economist Michael Hopkins, the number of jobless in the developing world cannot fail to rise dramatically, and soon, unless economic growth can be restored to levels above population growth.

Based on a review of data from 92 developing countries (excluding China), with a total population of 2254 million, the ILO study shows that the average rate of increase of Third World unemployment over the 1980-82 period was 0.8 percent. The reason for this surprisingly low figure appears to be that most of the countries surveyed are not heavily integrated into the world economy and therefore have been shielded somewhat from the effects of the recession in the industrialized countries. Thus, the rise in joblessness has been most pronounced in the more prosperous Latin American nations and among the Middle East and North African oil exporters and Nigeria, and least noticeable in Africa south of the Sahara, India, and Southeast Asia.

Unless the substantial economic growth rates of the 1960-80 period can be resumed, the rate of increase of unemployment in Third World countries is likely to more than double — to 1.9 percent — in the near future, says the ILO. The rate of economic growth in developing countries slowed to an average of around 1 percent per annum

in 1980-82, compared to a surge of some 5.5 percent a year in the 1970-80 period.

There is a distinct danger that population growth will soon outstrip economic growth, thus increasing the number of jobless even more. In many Third World countries, lower mortality rates will cause substantial increases in the active population, especially, but not only, in poorer regions.

In low-income Latin America, the labour force is expected to grow by 3 percent a year up to the year 2000, compared to a rate of 2.4 percent in the 1960-80 period. And, in the developing countries of Asia, where the population grew by an average of 2 percent in 1960-80, the rate of increase will be 2.5 percent yearly to the end of the century.

Mr Hopkins' calculations are borne out by figures in the ILO's report on employment policy to the 1983 International Labour Conference, which predicted that in the next 20 years, the population of the developing world will increase by some 2.5 percent a year, compared to an average rise of 1.8 percent per annum for the rest of the world. This will add 500 million more jobseekers to Third World populations by the year 2000, the report says.

Unemployment figures, however, fail to give a true picture of the job situation in the Third World, since they do not reflect the acute underemployment and poverty that exist there. Mr Hopkins' extrapolations from available data show a rise in underemployment (i.e., lack of access of workers to productive jobs commensurate with their skills) in developing countries (excluding China) from 447 to 482 million persons over the 1974-82 period. Once again, the newly industrializing countries of Asia did not

share in this phenomenon, despite sagging growth rates in the 1980s. The situation was worst in tropical Africa's poorest countries, where underemployment rose from 55 to 76 million persons in 1974-82.

The rise of underemployment is only partially determined by falling economic growth rates. The ILO study shows it increased between 1974 to 1980 despite an average growth rate of 5.5 percent a year in developing countries. And even if these substantial growth rates had persisted up to the present, underemployment would have continued to increase to around 450 million, according to Hopkins and the ILO.

Recession or no, the problem of underemployment is severe and unlikely to disappear without much greater increases in growth rates coupled with improvements in the distribution of income.

In this issue of *Reports*, five articles look at the employment-development equation from quite different perspectives. The role of crafts in generating employment and preserving culture is featured in "Crafts economies." Yet employment does not always engender development, as the article on the distortions wide differences in salaries produce in developing countries reveals. Some surprising statistics in Kenya suggest that the economy of the countryside is largely supported from the earnings returned there by people working in the cities ("Sending money").

The need to protect workers as a productive resource is brought home by the description of Singapore's industrial safety programs. And in a commentary, an analysis of the way international aid agencies decided to attack rural poverty through agricultural development suggests that after a decade of innovation, the programs have not lived up to expectations.



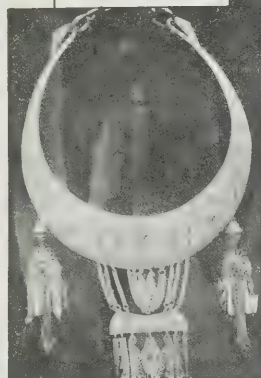


Peter Wenrich

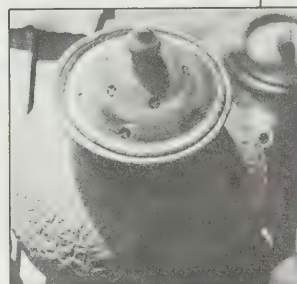
## CRAFTS ECONOMIES

### A QUIET RENAISSANCE

LORNE PETERSON



Elwood Pye



Elwood Pye

**D**ressed in clothes of many colours, the Mayan woman sat with a hip-strap loom attached to her waist. She began her weaving with a prayer. As she batted down weft threads of handspun and naturally dyed cotton and worked coloured yarns into designs and patterns, a beautiful cloth began to emerge. The Mayan people were worshippers of nature and this was reflected in the symbols of her weaving.

This woman lived some two thousand years ago. Today, we call her weaving work an art or craft. To her, it was a way of life — an expression of her culture and a means of sustaining life.

In Guatemala, Indian women who are descendants of the Mayans are still weaving on back-strap looms, and they still use many traditional symbols. But the effects of the Spanish Conquest and the impacts of the modern machine age have diluted and dissolved traditional weaving. Lilly de Jongh Osborne, a textile expert who studied Guatemalan weaving, wrote in 1965, "The Indian has been catapulted from an era of ancient custom and handicrafts into one of complex machinery, rapid transportation, and standardized clothing. Is it any wonder, then, that the Indian's crafts reflect his life by becoming an incomprehensible jumble of the ancient and modern? Indeed, the changes effected in the past few years... make it imperative to record as many of the techniques of Indian handicrafts as possible before they vanish entirely."

Similar stories can be told about the crafts of native cultures in countries throughout the world. But this situation has begun to change. A quiet renaissance in crafts production has been unfolding. In the last 10 years, efforts have been made in more and more countries to

revive traditional crafts and to create new handicraft skills.

The reasons for this crafts renaissance involve a realization by governments that unique cultures and their crafts are often the main tourism attractions, which increases foreign exchange earnings. Coupled to this is the failure of large- and medium-scale industries to provide enough employment for growing populations, and the alternative employment-creating potential of small labour-intensive crafts enterprises that use local technologies and materials. Craft industries provide the possibility of substituting locally made crafts products for expensive imported goods, and establish solid foundations for community development and for preserving precious cultural traditions.

These contributions of crafts to cultural, social and economic well-being have given rise to a new set of development questions. For example, what kinds of crafts enterprises have the capabilities to provide employment and income for people? What kinds of policies, assistance and incentives are needed to encourage and support such enterprises?

Such questions are only new in the sense that more governments, aid agencies and research institutes are beginning to pay attention to them. Since the 1950s, and especially in the last 10 years, hundreds of reports on crafts have been written, and many crafts development projects have been planned or initiated. The problem has been that most of these reports and projects have been ignored or underfinanced. A recent world-wide computer search of the literature on handicrafts and development undertaken by IDRC revealed another flaw — hardly any of the attention turned on the crafts industry was directed at the



artisans themselves. "Not much is known about the livelihoods of people who actually make crafts," says Elwood Pye, program officer in IDRC's Social Sciences Division, who initiated the search. "This is one reason why previous crafts programs have failed. The dynamics of the industry have not been captured."

There is still much work to do. "Most countries do not have statistics on crafts," says Peter Weinrich, executive director of the Canadian Crafts Council. In 1981, Weinrich attended "The International Conference On Rural Income Generating Craft Projects," in Bangkok, Thailand. Mainly Third World

of the goods were exchanged for goods from neighbouring countries — China was a particularly important trading partner. Although the crafts industry went into a decline during the periods of Spanish, then American colonization, because of competition from imported manufactured products, it has returned as a force in employment and exchange earnings today. The Philippine Chamber of Handicraft Industries estimates that about 700 000 people in the country depend on crafts for their livelihood. The estimate is supported by export statistics. In 1970, just US\$6.25 million in handicrafts were sold; by 1979 the

industrial manufacturers, and a lack of business skills and marketing assistance, further handicap the craft artisans.

To overcome these problems, the government and handicraft agencies have encouraged the creation of handicraft co-operatives. But most of the co-operatives have not been successful. They have suffered from a lack of capable leaders and from being too small and isolated to influence government policy and to effectively market their products.

It has been suggested that these problems could be resolved by developing regional and national level co-operative structures to give local co-ops support and assistance in training competent leaders and in marketing crafts.

This approach to developing crafts economies has worked in other countries. For example, Inuit arts and crafts co-operatives in Northern Canada have built up a successful system for producing and marketing their products. Effective government assistance and skillful marketing and promotion have made the co-operatives financially successful and independent. But another key reason, says Michael Casey, general manager of the co-op system, is that the co-operatives do more than produce and sell arts and crafts. "The co-ops we buy from are self-contained and multifaceted businesses in their communities. They operate retail stores, hotels, fish plants, airline agencies, contracting companies and so on. In each community, the co-op is generally the largest employer, outside of the government."

Native peoples in other countries have also combined crafts enterprises with other local industries to build up self-reliant economies. The Otavalo Indians of Ecuador, for instance, have become among the most prosperous native people in Latin America through establishing a crafts industry integrated into national and international markets, and by combining this industry with farming.

The first thing that impresses visitors in Otavalo is the special presence of the Indian people. The Otavalo men and women, who still wear their traditional costumes, radiate cultural pride and dignity. They have used their traditional weaving skills to establish a crafts industry that has allowed them to preserve and strengthen their culture. Since the early 20th century, most of the growing income from their crafts cottage industry has gone towards buying back land that had been taken away by the Spanish. For Otavalans, land, in the form of family farms, is an essential foundation for economic and cultural independence.

The Otavalans have demonstrated that a regional culture can develop economically on its own terms, and thereby retain its unique customs and heritage.

The economic and cultural potential of community-based crafts produc-

*The crafts industry has been studied, but not the livelihoods of the people who actually make crafts. The oversight is one reason crafts development programs fail.*



Craft industries provide employment and inexpensive goods for local consumption — such as baskets (left, Thailand), or furniture (right, Sri Lanka). They also provide important export earnings.

people were at the conference. "The message we got was that they knew more about the crafts situation in 1880 than they did in 1980." (Many crafts field studies were done as anthropological studies in the 1880s by the Smithsonian Institute and others.)

"More research is needed about what is being made, who makes it and where it is sold," says Weinrich. There is also a need for crafts development policies. "All the conference delegates felt they were floundering in terms of policy."

In the few countries where policies have been formed to encourage and support crafts, there are some impressive figures on the contributions of crafts to employment and foreign exchange earnings.

Handicrafts have played an important role in the economic and social life of the Philippines, for example. Prior to the 16th century, crafts were produced in virtually all villages. Many

sales had risen to US\$133 million. The increase represents a yearly growth rate of about 40 percent — nearly 2 1/2 times the increase in exports for the economy as a whole.

In India, over eight million people work at making handicrafts. Export sales of Indian crafts have been over US\$1 billion annually, and have accounted for 20 per cent of total export earnings.

But despite the efforts being made in India to encourage the growth of crafts, such as crafts training schemes, people who make handicrafts are still experiencing a major problem. Most of them live below the poverty line. Indian researchers say the primary reasons for this situation are the low labour productivity involved, and unfair prices for crafts. Artisans lack credit to buy tools and raw materials, which results in indebtedness to moneylenders and exploitation by crafts traders or middlemen. Competition from large



tion, combined with other local enterprises, is just beginning to be seen and understood. To survive and prosper, crafts producers will need to receive much more attention and support from governments. There must be a realization that crafts economies are just as important as industrial economies.

A number of studies are now being planned and carried out that will contribute to a global awareness of the vital contributions that crafts can and do make to development. The World Crafts Council (wcc), a nongovernment organization structured as a federation of national crafts councils, with members from 79 countries, is conducting a study on the role of crafts in the development process.

UNESCO is also organizing an international crafts conference, to identify

ideas and recommendations on how to protect, promote and enhance the role of crafts in cultural and economic development.

The multicountry research on crafts in Asia supported by IDRC represents the most comprehensive study of the essential elements of the industry — the artisans, how they work, and what sort of difficulties they encounter in producing and marketing their work. (See sidebar for details.)

Perhaps the most important part of the process of developing policies for crafts economies is to ask the craftspeople themselves what kinds of assistance they want. In the past, development policies have too often been made only from the point of view of well-meaning researchers and governments. In effect, policies have

been imposed on people. Frank Salomon, an anthropologist who has studied the weaving-farming economy of the Otavalo Indians, wrote, it is time "to cease thinking of how to manage other peoples' livelihoods, and to begin thinking how livelihood can become less a matter of management and more a fruit of local creativity."

To be relevant and to work, policies for crafts economies will have to be set primarily by craftspeople and their communities. □

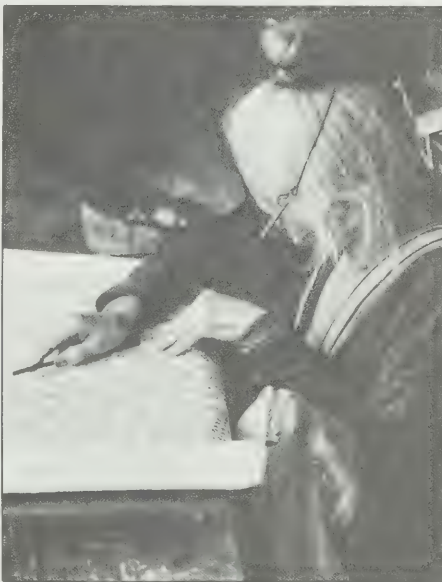
*Lorne Peterson works as a writer and researcher with an interest in social and economic development. He has a special interest in crafts, and has lived in Guatemala and travelled in several other Latin American countries.*

In Asia, the handicraft industry is of central importance to the economies of virtually all countries in the region. Five areas can be identified where crafts industries play a vital role in fulfilling national development goals.

First, in employment generation, in both rural and urban areas, handicrafts employ millions of people. In India, for example, at least eight million people are directly involved in crafts production. Second, crafts industries earn large quantities of foreign exchange through overseas exports and domestic sales to tourists. Thailand now exports over US\$300 million to overseas markets, the Philippines sells at least US\$150 million, and India's exports of handicrafts total over US\$1.35 billion, or 20 percent of its total foreign trade. Third, handicrafts make a contribution to equity and income distribution, as crafts making is often undertaken by people with little or no land. In Asia, land-person ratios have reached 1500 persons per square kilometre of arable land (Nepal); people must therefore seek work outside of agriculture. Crafts production fills this need. Fourth, these industries employ a large number of women and tribals, groups that are usually the most difficult for development agencies to reach. Finally, handicrafts contribute to the basic needs of the majority of low-income groups, as many craft articles are used in the home and have a nominal purchase price.

Despite the significance of crafts industries to Asian economies, very little research has been done on their main economic and social parameters. In particular, the people who actually make crafts, the artisans themselves, have rarely been studied. One can attribute this lack of interest to the fact that artisans often represent the lowest stratas of society and are usually

## SETTING FREE THE ARTISANS



*Studying the crafts: extending development to those most difficult to reach.*

ignored, they are widely dispersed geographically and therefore difficult to reach, and finally, they are not organized and cannot call attention to their industry in a dramatic fashion.

This lack of interest is rapidly changing however, as policymakers become increasingly aware of the benefits of a vibrant crafts sector. However, constraints prohibiting the growth of the industry need to be identified and removed through appropriate policy measures. Planners are therefore asking for national level data as well as microlevel data on individual industries. In many Asian countries, the IDRC's Social Sciences Division is now being asked to assist in this research effort.

During the 1984-85 period, the IDRC is planning to fund crafts research in Sri Lanka, Nepal, Thailand, the Philip-

pines, Malaysia, and Indonesia. These teams will link up with researchers already studying the crafts industry in India, and plans are underway to expand this network still further in Asia and at some future stage to involve countries in Africa and Latin America.

This Asian network represents the most comprehensive research program on the crafts sector ever undertaken anywhere in the world. With an approximate sample size of 5600, separate questionnaires will be prepared for artisans, investors, marketing middlemen, raw material suppliers and policymakers. In each country three key industries will be studied and data collected on the organization of production, the market structure, the socioeconomic conditions of craftspeople, demand constraints, supply constraints and finally, policy constraints. Industries have been selected that capture the dynamics of the international, domestic, tourist and local markets.

Research results will be disseminated through reports published in-country and through national policy dissemination workshops. Secondly, an international comparative publication will be released showing trends across countries. Finally, an international workshop is planned for late 1985 to which policymakers, researchers, and international agencies active in this field will be invited.

The IDRC believes it is important to work closely with other agencies and researchers interested in the development of the crafts sector. As such, any inquiries would be most welcome and interested parties are requested to write: Elwood A. Pye, International Development Research Centre, Tanglin P.O. Box 101, Singapore 9124.

*Elwood Pye*



# PUBLIC SERVICE EMPLOYMENT IN THE IVORY COAST

## CIVIL SERVICE BLUES

YACOUBA KÉBÉ

**T**he number of public servants in the Ivory Coast has climbed from 34 000 in 1970 to more than 75 000 now working in 36 government ministries. Ten years ago, the public service cost 24 billion CFA francs a year (about CA\$106 million); today it costs 180 billion CFA francs (about CA\$800 million) annually.

Government employees function within a career system inherited from France. In this system, the employee devotes his entire life to the service of the state and, in return, the state ensures a career with ample opportunities for advancement. This choice makes the Ivory Coast public servant a privileged worker, and the most important privilege lies in having job security. In fact, the likelihood of an Ivory Coast civil servant losing employment is almost nil — provided the employee is honest and behaves properly.

Elementary school teachers and education personnel as a whole account for 39 percent of the total employee strength; teachers alone absorb more than a third of the payroll. The top officials in the field of education draw starting salaries of 543 000 CFA francs a month (about CA\$2400), much more than the highest administrative officials. Administrators enter the public service at only 139 000 CFA francs (just over CA\$600). These salaries are greatly out of proportion, and in no way reflect the respective functions and abilities. There are 4000 technical assistants, most of them working in the field of education. Only 15 percent of the public servants in the Ivory Coast are women, most of them working in junior positions.

In 1971, the then Public Service Minister, Joseph Tadjó Ehue, deplored the tendency of the public service "to consider itself a privileged community, even a social class apart." Though the career system shelters the government employee from unemployment, it does impose certain obligations in return. First of those obligations is that the employee must, in principle, devote the 42 hours of the official work week to the department that employs him or her. (The hours of work are from 8:00 am to 12:30 pm — including Saturday — and from 3:00 pm to 6:00 pm.

*Generally perceived by governments of the Third World countries as the principal vehicle for all development activity, the public service enjoys special attention. In a country like the Ivory Coast, to be employed in the public service is to be a worker for development. Or is it?*

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*"If a public servant is not at his desk, he is not at home either. He has just gone to settle his day-to-day problems. He has to eat, and feed and care for his family, and you can't do that by sitting in your office."*

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Government workers are also prohibited from carrying on any private activity for profit through an intermediary.

It is not necessary to be an inspector of government services, however, to realize that some Ivory Coast public servants — led by some department heads — have completely lost sight of these obligations. Up to half of their 42 working hours are spent attending to personal affairs.

In reply to a questionnaire, 95 percent of the government employees interviewed stated that there is total indifference in some public services. Government employees are, for the most part, disagreeable in their dealings with the users of their services — when they are there to provide them. They very often arrive late, or not at all. When interviewed, the service users seemed completely disgusted, such as the head of an industrial concern who has had no contact with the government since 1975 because, he says, "It is utter chaos. Government employees do not believe in what they are doing. They do not seem to realize

that they represent the State. They take liberties that I would never, ever, tolerate in my business."

A bank officer accuses government directors and department heads of not setting an example. "They arrive at work at 10:00 am and leave again before noon. In the afternoon, they come back at 4:30 and leave before 6:00 pm. They may

even be absent for an entire day. They spend most of their time — when they are there — telephoning or visiting with their friends. During this time, these desk jockeys do whatever they can get away with." Public servants say they agree with these judgments; they believe that if the bosses carried out their work of training and supervision properly, the Ivory Coast public service would have a better image.

Replies to a survey of government employees and users in the interior seem to indicate that the situation is decidedly better outside the capital. Absenteeism, excessive lateness, lack of professionalism, and lack of civility are practically unknown in government departments in the interior. According to one primary school teacher, this good behavior could be due to the fact that in a regional centre, public servants and users know each other. "Relationships are more fraternal and human, and the government official is obliged to safeguard good relations by exemplary professional behaviour."

Public servants in the capital explain their general indifference by pointing to the low salaries of the public service. These salaries do not allow a decent life style, they say, and provide only the barest of necessities.

Salaries bear no relation to high-flown titles such as department head, deputy, director, and so on. The state employees point out that, university degrees and ability being equal, it is not right that the public servant be paid, on average, one-third the salary of private-sector counterparts.

"Out of my salary of 65 000 CFA francs (about CA\$290) a month," says a legal secretary, "I pay 14 000 francs (CA\$62) for my rent, 10 000 francs (CA\$44) for water and electricity, and 34 000 francs (CA\$150) for food. I am not living, I am just surviving." An agricultural engineer who draws



134 000 CFA francs (CA\$595) a month admits that he is obliged to duck out twice a week to look after his own farm. "If a public servant is not at his desk," observed a senior government official, "he is not at home either. He has just gone to settle his day-to-day problems. He has to eat, and feed and care for his family, and you can't do that by sitting in your office."

A few will justify corruption and misappropriation of public funds by suggesting it is a response to the low salaries. There are many who point out, however, that those guilty of such things are most often senior officials, directors, and other heads of departments who can help themselves to tens of millions of francs without concern. "But," writes a clerk from Abidjan, "a minor public servant only has to misappropriate 100 000 CFA francs (about CA\$450) to be fired and imprisoned."

Those who cannot continue to work in the government and come to terms with themselves, choose to resign and either work somewhere for themselves or go into the private sector — if they can find work there. Most public servants opt for leave-of-absence, which permits them to pursue gainful activities while retaining the option of returning. However, few return. Leave is limited to three years and becomes desertion of position when recalls are unheeded. Recent figures list 509 desertions of position.

Aside from salary, one of the principal recriminations of public servants concerns advancement. A government employee normally moves up a level every two years. This is not automatic, however; he or she must first be appraised by the supervisor. Most employees agree that the appraisal — a mark from one to five — never takes the employee's work into consideration, but depends instead on extra-professional factors. For some chiefs, an appraisal is the best way of settling personal scores with their subordinates, as supervisors are not obliged to inform employees of their mark. Others deliberately mislay appraisal records in order to avoid facing an employee who received a negative appraisal, or to block the advancement of subordinates perceived as rivals.

Public servants are also victimized by colleagues in the Public Service Ministry and the ministries in which they work. Many new employees receive their first pay only after six, eight, or even twelve months of work. It is reported that some college professors had to raise a subscription at the end of every month to help two of their colleagues, victims of administrative delays.

Although in principle, the Ivory Coast public servant may be sure of holding his or her job indefinitely, in fact this depends on the goodwill of the supervisor.

The severest penalty provided for in the public service statutes is suspen-

sion, which entails salary cuts of up to 50 percent. The problem is that nowhere in the civil service regulations is there a definition of a "serious offence," which alone can lead to suspension. The text merely states that it consists of a violation of professional duties, vague terms that give free rein to arbitrary action. This vagueness gives government managers the opportunity to impose extreme penalties for minor offences. Prefects and sub-prefects suspend public servants for harmless offences. Ministers do the same thing. Abuses were such that in recent years, the President had to intervene to ensure that the cases of state officials subject to removal from office or dismissal for any reason were properly investigated.

The overall impression that emerges from the survey is of a public service hamstrung by principles and statutes inherited from the colonial era and, above all, of a public service most of whose leaders do not in any sense conduct themselves as befits the servants of the State and the defenders of the public interest. But with the administrative reform begun in 1977, it is hoped the public service that has traditionally been limited to a managerial role will be transformed into a genuine instrument for development. □

*Yacouba Kébé is a journalist with the Fraternité-matin newspaper in Abidjan, Ivory Coast. This article is based on a survey and series of stories conducted by the newspaper.*

## SQUEEZING MONEY

Ivory Coast is not alone with its public service blues. An IDRC-supported study of public sector salaries in seven African countries found that the considerable difference in salaries between top bureaucrats and the general population was producing economic and educational distortions that hindered development.

The study focused on the public sector for a number of reasons. First and foremost is its sheer weight in the countries concerned — Egypt, Ghana, Kenya, Morocco, Nigeria, the Sudan, and Tanzania. In Nigeria, for example, the public sector accounts for 38 percent of the GDP (Gross Domestic Product) and 65 percent of all employment. Moreover, the public service is considered the vehicle for development by all the governments in the study, regardless of the various development strategies that they have chosen to pursue. All have embarked on ambitious development programs, which have required massive increases in government for their fulfilment — health services, educational services, agricultural extension, and investment in infrastructure.

From the economic point of view, the persistence of high salary levels and differentials (and the use of educational qualifications as criteria for recruitment to the salariat) encourage the pursuit of schooling to as high a level as possible, say the authors. "The results include an explosive expansion in educational enrolment at all levels, a high rate of rural-urban migration, and an inflation of the proportion of the government budget that goes on schools (to 30 percent or more in some countries). . ." The result, the study reports, "is an excessive supply of educated labour at all levels, increasingly affecting even university graduates, and the diversion of the

economy's surplus from capital accumulation to (arguably irrelevant) schooling. In addition, there are complex class-formation effects, with a bureaucratic élite sometimes forming an obstacle to progressive, developmental policies. . ."

All these considerations — and the fact that public sector salaries are the only ones amenable to government manipulation — make the study of public sector salary differentials a good place to begin.

In their quest for an explanation of salary differentials, the authors were forced to reject the notion that they are the result of supply and demand (i.e. shortages of qualified human resources), mainly on the evidence of university enrollments and the beginnings of graduate unemployment.

It would appear, rather, that wide differentials are a legacy from colonial times, when salaries had to be high enough to attract expatriate personnel to "inhospitable" and distant parts of the world. In some of the countries, *ad hoc* salary commissions and committees were struck to set public sector salaries, but few attempted to fundamentally alter the inherited public sector salary structure.

It appears that, unless countries have taken specific steps to redress differentials, top-level civil servants have continued to be paid at relatively the same rates as the expatriates who occupied their positions before them. And, such progress as has been achieved in reducing the gap is mainly due to the need to compensate unskilled workers for cost of living increases. "Governments, whatever their political complexion, have had little alternative but to try to maintain the bare subsistence standard of living of workers at the bottom end of the salaries hierarchy," the study notes.

*Hope Cadieux-Ledoux*



# INDUSTRIAL SAFETY IN SINGAPORE

## NO ACCIDENT

SUSAN HELWIG

**F**or its rapid industrialization in the past two decades, Singapore has had to pay a heavy human price — a major increase in occupational health problems. Fortunately for the island city-state's increasingly sophisticated workforce of 1.4 million people, modernization has also been accompanied by a determined effort to improve on-the-job safety.

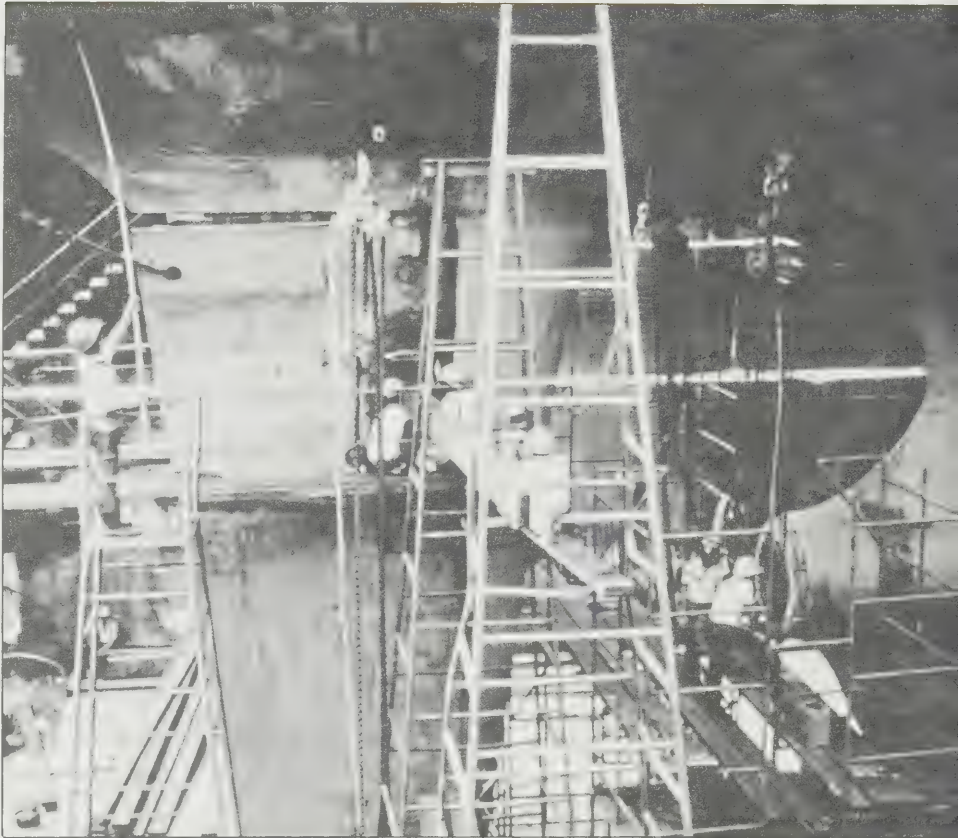
In 1971, there were close to 2000 reported work accidents in Singapore; by 1981, the figure had more than tripled. This rate of increase outpaced the growth rate of the workforce. Moreover, industrial health specialists stress that these accident figures, as well as those for occupational diseases, are conservative because of gross underreporting by factory managers, doctors and employees. This may be due to ignorance, or perhaps fear of reprisals if safety laws have been broken.

Recently, however, government officials have begun to note a change. For the first time, according to Ministry of Labour statistics, there has been a decrease in the number of reported accidents. For 1981, the total for all industries was 6046; in 1982, the figure fell to 5891.

A senior safety official at the Ministry of Labour attributes the change to the enforcement program run by his department. It has the authority, for instance, to do a surprise safety check on any factory and order a halt to work if necessary. Significantly, a union official echoes this view: "In Singapore we have laws and we enforce them."

A different explanation for the lower number of accidents is held by a physician, a lecturer in the occupational health unit at the National University of Singapore. He points out that there is "a high degree of co-ordination" in Singapore's occupational health effort.

In virtually every aspect of occupational health and safety, programs are in place. Safety on the job is being tackled through training and promotion. Laws are being adjusted to set new standards. And an ambitious program has been launched to prepare general practitioners for the task of monitoring the health of workers in



*Singapore shipyard: "Ten years ago you didn't see many hardhats in the shipyards." Today, a safety training program and fewer fatalities.*

hazardous occupations to detect and prevent disease early.

In the late 1960s the occupational disease of greatest concern to government health officials was silicosis, caused by dust from granite quarries on the island. Nowadays, the most widespread problem is industrial dermatitis. While only 10 cases were reported in 1972, the figure had jumped to 379 a decade later.

Industrial dermatitis can be caused by natural materials including indigenous plants and woods, by synthetic chemicals such as trichlorethylene and xyelene, or by metals such as chromates and nickel. Workers in industries using lubricant, cutting or coolant oils also face an increased risk of industrial dermatitis.

Other industrial chemicals pose a more general threat to workers that is difficult to deal with. Says Dr Phoon Wai Hoong, director of the Ministry of Labour's Industrial Health

Division: "The problem is that there are unknown health effects from substances that may not have been adequately studied and from those with unknown compositions." In Singapore, companies are required to list the chemicals they will be using, including toxic substances. Officials then review and approve their use before a chemical factory is registered to begin operating.

After industrial dermatitis, noise-induced deafness is next on the list of serious occupational hazards, with 136 cases reported in 1982. Under a hearing conservation program launched in 1975, the Ministry of Labour's Industrial Health Division advises factories and shipyards on how to cut down exposure to noise. Methods include isolating loud equipment, rotating employees to reduce the time spent in noisy areas, and requiring the use of ear protectors. Factories are also advised to arrange annual hearing examinations for workers exposed to



loud noise.

By next year, annual health examinations are to be made mandatory in Singapore for certain types of workers exposed to health risks. These will be performed by physicians trained in occupational health who have been designated "factory doctors" by the government. The checkups will involve both clinical examinations and laboratory tests. By so monitoring health at the grassroots, it is hoped that problems can be identified before they erupt.

In the field of job safety, Singapore has a success story to tell about its shipbuilding and repair industry. In the early 1970s, when the shipyards began to grow in size and number, the factory inspectorate at the Ministry of Labour began to record increasing numbers of serious accidents and it was decided that "drastic" measures were needed. The government persuaded the industry to enforce a rule that all shipyard workers be trained in job safety. Since 1976, more than 60 000

is given in a number of languages, including Thai, and officials at the Ministry of Labour expect that 100 000 people will have taken the course by 1985.

In 1981, Singapore's National Productivity Board (NPB) was given a broad mandate by the government to develop a "productivity movement" modeled in many respects on the Japanese system of labour/management relations. Training and promotion in occupational health and safety were transferred to the Board from the Ministry of Labour, and activities have been stepped up. Freddy H.C. Soon, director of Promotion and Information at the NPB, explains that productivity requires employees to be well trained and educated. "They must also remain healthy and their work environment must be safe."

The NPB offers 11 courses in occupational health and safety. Those for safety officers in large industrial enterprises and for members of safety committees, as

the national level, Singapore benefits from having an internationally recognized occupational health training institution. In Southeast Asia, the Department of Social Medicine and Public Health at the National University of Singapore has pioneered postgraduate training in occupational health for doctors. Its Master of Science program in Occupational Health attracts students from all over Asia.

In one of the department's research projects, students analyzed the lighting in a typewriter plant. Improved illumination resulted in a 22 percent increase in the plant's output.

The department is headed by Prof Phoon Wai-On, a physician and tireless campaigner for occupational health, who is also research committee chairman for the Asian Association of Occupational Health. Prof Phoon stresses the importance of building awareness as a first step: "Without identifying problems and quantifying them, you can't persuade countries to spend money on research in occupational health."

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#### SMALL IS HAZARDOUS

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Prof Phoon's committee recently received funding from IDRC's Health Sciences Division to do such identification work in the small-scale industrial sector where the level of occupational safety lags behind that of the larger industries. In Singapore, Hong Kong, Korea, and the Philippines, researchers will evaluate working conditions, occupational health problems and related health services in a number of small plants involved in metalworking or dealing with lead or lead compounds. Some studies of workers in these high-stress, hazardous industries have been carried out, but, overall, information is scarce, particularly with regard to human exposure to lead. This "network" project by Prof Phoon's team and their counterparts in other countries will help fill the gap.

Singapore is not alone in Southeast Asia in facing rapid industrialization and in trying to deal with health problems through training, research, and other methods. According to Prof Phoon, it is impossible to quantify accurately the burden of industrial disease in Southeast Asia. Indeed, he suspects the number of cases is grossly underreported by doctors and factory managers. Nevertheless, because all countries in the region are tightening enforcement and improving medical training, Prof Phoon concludes "there is little doubt that standards of occupational health should appreciate in the near future." □

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*Susan Helwig is a freelance journalist recently returned to Ottawa from Singapore.*

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*By 1985, 100 000 construction workers will have taken a safety orientation course in Singapore. Safety is another form of job security.*

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workers have taken a basic safety orientation course. A senior official at the Ministry of Labour points out with pride that the number of fatalities has been going down. A union official puts that trend in context: "Ten years ago you didn't see many hardhats in the shipyards. Now they're being worn."

The training system used in the shipyards has become a model for the kind of self-enforcement the government is encouraging other industries to adopt. Last year, a second large-scale training program was launched as Singapore turned its attention to the construction industry which, as in most countries, is a major source of industrial accidents.

In recent years, a building boom has transformed Singapore's skyline into a silhouette of high-rise office towers and hotels. The workers, many of them from neighbouring countries, are unskilled. Few have experience working from platforms on lofty towers and accidents often occur when fatigue sets in and the unfamiliar becomes fatal. The number of accidental deaths in the industry rose from 29 in 1981 to 50 in 1982 — the highest for any industry in the country.

To help prevent accidents, a four-hour safety orientation course was prepared for construction workers. It

well as the newly created course for doctors, are all required by law. Optional courses are available for management and supervisory personnel. Soon the NPB will also add courses in industrial health for nurses, and specialized safety courses for workers building the country's Mass Rapid Transit line. The government would like to avoid decompression illness among underground construction workers.

Nearly every day of the week, courses are going on at the NPB's headquarters in Singapore. In one classroom recently, a group of 20 people, most of them in their late twenties, listened to a lecture on how to prepare a "fault tree" diagram to analyze the cause of an accident. The course is open only to qualified engineers, and the cost is paid by their companies, often with a government subsidy. The engineers attend lectures three times a week for nearly four months and must write an exam. They also work on a practical project before being certified as safety officers, qualified to serve full-time in the larger industrial enterprises. Asked if the course would enhance their careers, one practical-minded Singaporean volunteered: "It provides job security."

While the National Productivity Board coordinates safety training at



## SENDING MONEY

FIBI MUNENE

**"L**ooks like we'll be working overtime this month, and can't make it home," says Mbuvi Mwendwa to his companion walking beside him on the busy Nairobi street. "Let's hurry to the post office before the queues become too long, and send money orders to our wives."

Mbuvi and his friend are typical migrants to Kenyan cities: they maintain close links with their families and relatives because they intend to return to the countryside in the future.

After eight years of primary education, Mbuvi left his rural home for Nairobi, the fastest growing urban centre in Kenya, to look for wage employment. Since then, he has been sending about three-quarters of his salary to his wife, who still lives in the country. He says that the money is used for feeding and educating his six children, for building the family a modern house, improving land, and buying improved livestock. He is also saving some money for starting a small business when he returns to his rural home.

Throughout Kenya, migration is a major feature of population change. People, especially young people, leave their rural villages to look for jobs in the cities. For example, in 1973-74 migrants in Nairobi and other urban centres made up over 20 percent of the population of Kenya.

Some studies of this phenomenon in Kenya have raised questions concerning continued population movements and their effect on rural development. According to some researchers, one of the larger issues not well investigated concerns the remittances sent by migrants to their places of origin. While social anthropologists and economists agree that remittances have a positive effect on rural households, they hardly consider them in the context of general rural development.

### CASH FLOW

In 1974, a study in Kenya found that 89 percent of employed migrants sent money to their homes in the countryside. The average amount remitted was KShs. 85 per month (about CA\$8) or approximately 21 percent of the migrant's salary. A recent World Bank study, *Poverty and Growth in Kenya* by Paul Collier and Deepak Lal, notes that remittances are a very dependable source of income in the rural households.

Current economic hardships have made the role of the urban migrant even more important. Inflation coupled with the declining prices of agricultur-



*Lineups to buy money orders at the Nairobi post office: money earned in the city flows to rural areas.*

al commodities has had more adverse effect on the rural than the urban population. To counteract the unfavourable economic situation, some members of the rural households migrate to urban centres to look for wage employment and remit some of their earnings to their families.

A study financed by IDRC's Social Sciences Division has tried to fill some of the gaps existing in the understanding of the effects of remittances by investigating the interrelationship of migration, remittances, and rural development.

Undertaken by Drs Mohammed Mukras and John Ouchao of the University of Nairobi, the study analyzes data collected from the rural areas of the Kisumu and Siaya districts and the cities of Nairobi and Kisumu from November 1981 to November 1982. Information was gathered from a sample of 427 migrants from these cities and their rural households.

The two rural districts were chosen because they lose a substantial portion of their population to other parts of the country. It was also considered important to look at areas that are less developed but have a potential.

In addition to subsistence farming and fishing, families in the two districts depend on money sent by relatives who have migrated to the cities for livelihood. The urban migrants interviewed in this study said that they would return to their rural homes: urban migration is seen as a means of

supplementing income and mobilizing resources for various investments in the rural areas.

Urban households apparently send an average of 27 percent of their wage earnings to rural areas. Over 92 percent of the urban households surveyed send money to their rural families at least four times a year.

A survey of the expenditure of remittances shows that most of it (about 44 percent) is used to build houses, another 22 percent is allocated to land development and about 16 percent is for purchasing land. These figures suggest the importance that the urban migrants attach to their areas of origin and their intention to return there.

### ABSENTEE DEVELOPMENT QUESTIONED

Some researchers argue that the role remittances have played and are likely to play in the realization of rural development is limited. Instead of investing remittances in agriculture and other productive activities, a considerable amount of the money transferred to the rural areas is used for paying debts and supporting relatives and friends, it is suggested.

But the authors of *Poverty and Growth in Kenya* point out that "it is the close two-way link between rural smallholders and formal sector employees which in large part have determined the pace of rural development in Kenya." Many rural farmers depend on remittances for buying, for example, the agricultural inputs of fertilizer, seed, and pesticides essential to production.

The smallholders have no access to bank loans for improving farming. The risk of borrowing money without "non-farm income" is that land offered as security might be sold. In a recent survey of smallholders with loans for farming purposes taken from the Kenya Commercial Bank, it was found that 70 percent received income from wage employment.

Because of the importance of remittances in rural development, the researchers at the University of Nairobi recommend that the urban migrants who consistently send money to the countryside should be excepted from paying tax. This would provide an incentive to send a higher percentage of their wage earnings to the rural areas, and stimulate development there further. □

*Fibi Munene is regional liaison officer in IDRC's Communications Division based in Nairobi.*



# LIVING ON RESULTS

JACQUES DUPONT

**T**he small town of Bambey, 110 kilometres east of Dakar, Senegal, is the site of one of the largest agricultural research institutions in Francophone Africa: the Centre national de recherches agronomiques (CNRA). There, *Reports* met with the director of the sorghum research program, Marcel Galliba, a few months prior to his departure for the United States to pursue doctoral studies at Texas A & M University. With financial support from IDRC, Mr Galliba has been working for approximately 10 years on improvements to sorghum, one of West Africa's staple foods. The aim is to develop new, faster growing varieties characterized by greater resistance to disease and drought.

**Reports:** What are some of the problems you have tackled in sorghum research?

**Galliba:** The government plan asked us essentially to increase yields, reduce stem size and, in particular, improve the quality of the grain. The traditional varieties contained an excessive level of polyphenol, commonly known as tannin, which inhibits protein synthesis in humans. We have succeeded in producing new varieties low in polyphenol. We have also developed dry hulling techniques. Previously, manual hulling was done using a pounder and a little water, but the moist flour produced this way does not keep. With dry hulling and grinding, flour can be stored for months.

**Reports:** How many useful varieties have been developed?

**Galliba:** Ten. After approximately 10 years, we have developed 10 high-yielding, stable varieties resistant to the occasional droughts we experience. We tested this material here in Bambey, in the Sine-Saloum, and especially in Casamance. These tests enabled us to identify its limitations, as well as the conditions necessary for obtaining optimum yields. For example, we know now when to sow, when to weed, when to thin from six stems down to two or three, and so on — simple, understandable facts that merely

have to be determined and included in the technical notes. All these techniques can be grasped by the average Senegalese farmer, and everyone who has followed the instructions has obtained colossal yields of some 2.7 to 3 tonnes a hectare.

**Reports:** Do these new varieties require the use of large quantities of fertilizer?

**Galliba:** They require 100 kilos of fertilizer to the hectare; this costs about 2500 CFA francs (about CA\$11) in the case of subsidized fertilizer. The same amount of unsubsidized fertilizer costs approximately 10 000 CFA francs (about CA\$45), but even at that price production will still increase by at least 500 kilos per hectare, if not a tonne, and at a market price of 50 CFA francs a kilo for sorghum that means a profit of 25 000 CFA francs (a little over CA\$110) for each hectare in cultivation.

**Reports:** And is there currently enough subsidized fertilizer for farmers wishing to use it?

**Galliba:** No. Senegal has 2 000 000 hectares of grain crops, for which 50 000 tonnes of fertilizer have been allotted. This means that only 25 kilos of fertilizer are available per hectare. Although the policy is that agricultural production must be increased, there is

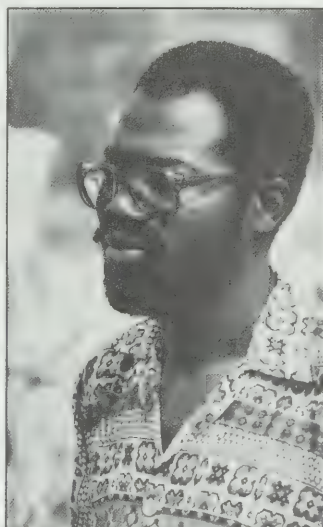
a tremendous gap between the objectives and the means available. The ideal would be 100 kilos per hectare, but we cannot hope for that — there is no inexpensive fertilizer to be had. However, even at the unsubsidized price, the new varieties are still highly profitable. Still, not all farmers — few of them, in fact — are able to come up with the large sums required. Credit structures will have to be reformed as well.

The biggest problem faced by African researchers is that they cannot do anything with their discoveries. Despite the great enthusiasm with which these discoveries are greeted, they cannot be taken any further for lack of adequate feedback from the farmers. If a farmer came to me and said "Look, sorghum SBV-4

has such and such a problem," I would be able to rack my brains to come up with a solution. As it is, I am forced to rest on my laurels. We already know *how* to improve agricultural life, but we cannot manage actually to *do* it.

I do think, however, that we should take research activities out of the centres and the institutions. Governments should give priority to agricultural development. Give us five years... but give us the tools to do a proper job. We are currently experiencing all kinds of limitations caused by budget cuts. What is needed is for governments to invest in the agricultural sector and in helping the small farmer.

Researchers should also be expected to produce and to produce rapidly. Give me a piece of arable land and I will live on my harvests, for I would then be forced to produce profitable harvests and would be faced in a very real way with the results of my research. Then we would no longer be research teams living and producing answers in isolation, but researchers and scientists forced to produce results and to stake our lives on them. When that happens, perhaps, we shall succeed in bridging this deplorable gap between the research institutions and the farmers. □



Marcel Galliba (left), and the object of 10 years of research — sorghum.

*"Although... agricultural production must be increased, there is a tremendous gap between the objectives and the means available."*



# VOICES FROM THE PAST

## TRADITIONAL YUNGA AGRICULTURE

JOSÉ SABOGAL-WIESSE

The Andes is considered one of the handful of genetic centres from which cultivated plants have spread throughout the world. Among the useful plants that originated in the Andes are the sieva and other beans, the peanut, Peruvian cotton, potatoes, maté, and squashes. And there remain many indigenous plants, such as the food grain quinoa, that have significant potential uses yet to be exploited in other parts of the world.

Yet there are fears that the wild precursors of many modern crops and the traditional farming methods that preserved them — and continue to preserve potentially valuable species and production systems — may disappear before agriculture is able to take full advantage of this heritage. Such concerns gave rise to a study of a tradition of agriculture in the Andes by Peruvian agronomist and economist Dr José Sabogal-Wiesse. Dr Sabogal-Wiesse studied 55 oasis communities along the Pacific coast of South America to record the traditional agricultural methods and crops of this unique area.

begun with the help of IDRC in December 1981, the work was carried out mostly in Moche, a coastal town 548 km north of Lima, Peru. Here Dr Sabogal-Wiesse collected data on the wealth of knowledge possessed by the coastal, or Yunga, Indians who have farmed this inhospitable land for generations.

Don Leopold Fernandez Nique, an ex-schoolteacher from the town, provided invaluable help in the study because of his extensive knowledge of ancestral methods of farming and cultural lore. The Yunga people and agriculture were also documented by pen and ink sketches (some of which accompany this article) by José Segura, a painter likewise familiar with the coastal area of northern Peru.

Sadly, Dr Sabogal-Wiesse died before he was able to complete the study — the culmination of 10 years of observations and documentation. This article, originally drafted by Dr Sabogal-Wiesse, was completed by freelance editor and translator Elena Keen after his death.



**A**rchaeological discoveries at Huaca Prieta in the Chicama Valley, 600 km north of Lima, Peru, indicate that agriculture first appeared in the alluvial oases of the northern coastal desert some six thousand years ago. In this narrow desert strip, which runs along the Pacific coast from southern Ecuador through the northern third of Chile, farming was made possible only by irrigation with water from the rivers that descend some 150 km to the Pacific Ocean from the western ranges of the Andes. In this way, 55 artificial oases were formed. They constitute approximately 700 000 hectares of Peru's total three million hectares of cultivated land, and have inherited the best physical infrastructure of any farmland in the Andes. All of this was created by highly advanced indigenous civilizations thousands of years ago.

The challenge of existence in a desert environment that grew more arid with each passing century was more than met by indigenous cultures and civilizations in the desert plains of the Andes. The creativity of the *yunk'ino* (Yunga), the Quchua name by which the natives are still known, is enormous. The first

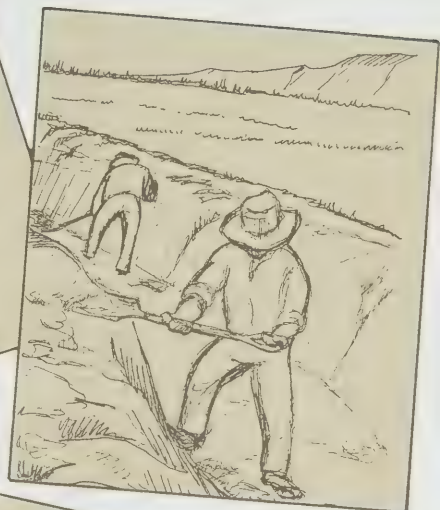
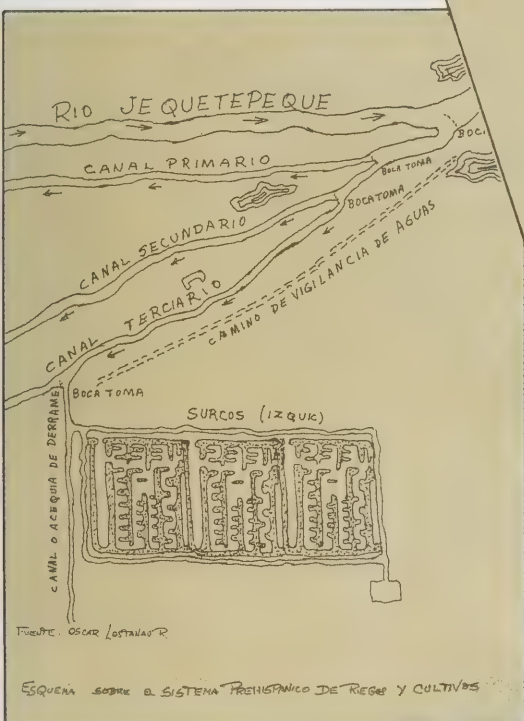
known evidence of this creativity dates from about 10 000 years ago and was found in the small alluvial oasis of Chilca, 70 km south of Lima.

The existing irrigation system there was built by 14th century Indian stonemasons. In their 15th century conquest, the Incas did much damage to this delicate and ingenious system, so much so, that today only one-third of the land once under cultivation is used. But many of the channels and sluices of this system are still in operation, having been reinforced over the ages, lately with concrete and steel.

As Don Leopold, Dr Sabogal-Wiesse's main informant, says, "water is life." The indigenous population is dependent on water, which is always scarce. It is not surprising therefore, that forecasting the arrival of water, as floods or rain, is of overriding interest to the native population. An indigenous weather forecasting system has evolved, which relies on eight or nine omens. The position of the new moon is observed — halos around the moon or the sun are important augurs of rain and weather. The way the constellations lie with respect to the mountains and the "River Jordan" (the Milky Way) is



(Opposite) Moche, a virtual oasis in the Peruvian coastal desert, created by native people. (This page, clockwise from top) Don Leopold Fernandez Nique, a voice of the past. Clearing a waterway — much of the system predates the Incas. Crops grown on mounds to take advantage of water in swampland near the Pacific beach. An early irrigation system (rectangular area at bottom is filled by crop rows).



another indicator. Closer at hand, the early flowering of the mango tree, and the flight of the pardela, a type of gull, are weather omens. If December fogs are late, people still say "It will be all right, this will be the summer of El Niño (an ocean current that brings with it rain and moderating climate)." Now largely ignored by the young, and viewed as "superstitions" by teachers and technocrats alike, some of these signs appeared to be amazingly accurate, interpreted the same way from one town to the next by knowledgeable elders. Indeed, in 1978, Dr Sabogal-Wiese was able to verify that the forecast for the agricultural year in Socos (Huamnaga), over 1000 km southeast of Moche, which was based on precisely these omens, was completely accurate, as was the one for Santiago de Cao, also some distance from Moche.

#### WATER IS LIFE

The list of indigenous practices centred on water is virtually unending. For example, another interesting technique is the procedure by which run-off waters are used in all these valleys, "like

they did in the old days," to expand the land available for cultivation.

The procedure is quite simple. The sand dunes are denuded of vegetation, mostly grass, and deep channels are cut through them. The run-off waters spill through the channels to the lower lying lands, carrying the sand along and in the process levelling the dunes. The water pools at lower levels and deposits silt mixed with the sand. The standing water is drained off, and the field thus created in the wake of the run-off is ready for cultivation. For the first three or four years crops are rotated to ensure proper build-up of nutrients.

Crops and diets reflected the primacy of water. Many of the elders referred to the traditional diet of their ancestors, which was based on local crops requiring much less water than modern crops. Indigenous plants were said to thrive on one or two "heavy" waterings. Native food supplies were more abundant then, it was reported, more in keeping with local tastes, and more varied.

Many of the various plants and skills developed in response to the harsh environment of the desert plains of the Andes are still in

existence today. But increasingly, land is being lost to the desert because of "modern" human activities. Deforestation of delicate semi-arid areas is accelerating, as the present preoccupations and needs of many new settlers override the sustainable practices of tradition.

The remedy for this, as in many other cases of ecological abuse, is perhaps to return to the traditional methods for conserving and restoring the land. The recording of the practical ancestral knowledge passed on by word of mouth by the elders of these communities is an important step towards this return. But the question remains: will anyone listen to the voices from the past? □

*Agronomist by profession, Dr Sabogal-Wiese was highly regarded for his social conscience as well as his professional skills, and for the inspiration he gave to a generation of social scientists. He was especially concerned with the coastal villages of Peru: the manners and customs of the people, their everyday life, and their handicrafts. He wrote a book on the handicrafts and ceramics of Catacaos, a coastal city of Peru.*





(l to r) Michael Glorian, project co-ordinator, Jean-marc Rousseau, Sang Nguyen, Nelio Pizzalotto, and Teodor Gabriel Crainic.

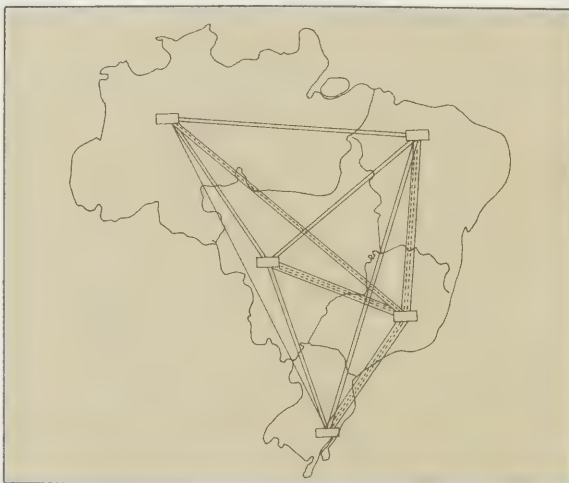
## AT THE CROSSROADS

### A TRANSPORTATION STRATEGY FOR BRAZIL

RAYMOND LEMIEUX

**B**razil. A country of 8.5 million square kilometres, it covers half the South American continent. With such a vast territory, commercial transportation plays a vital role in the country's economic development. But the trains, trucks, and ships on which Brazil depends are now feeling the effects of energy dependency and past industrial instability. The transportation system needs to be reorganized. But how, and to what end? "It's a question of the right tools and the right approach," claim researchers at the University of Montreal's Transportation Research Centre.

In 1979, the Science and Technology Centre of the Pontificia Universidade Catolica do Rio de Janeiro and the Montreal research centre agreed to participate in a co-operative project. "A challenge," says Michael Florian, co-ordinator of the project. Eight other researchers from the two countries round out the team — Brazil is providing the data and statistics, Canada the analytical methods and data processing experience. "It's easier and cheaper to build and test a new railway on a computer before starting on the real thing," adds Prof Florian.



*Freight exchanges in Brazil: the southeast is heavily trafficked.*

The use of data processing technology was deemed an absolute necessity, since Brazil's commercial transportation system is so complex that it would be impossible to process the data otherwise within a reasonable period of time. And time is of the essence, because freight transportation has to keep pace with the economic and population growth forecast for Brazil in the coming decades. So it was that the many possible strategies and options for transport in Brazil were traced out on the cathode screens at the University of Montreal by Canadian researchers — together with their Brazilian counterparts who come to Canada for

regular training sessions.

"Railways offered the most promise," says Jean-Marc Rousseau, director of the Transportation Research Centre, who is also participating in the project. "Trains consume little energy and rail transportation is relatively inexpensive — two big advantages." The figures given by the Brazilian ministry of transportation indicate that it is in fact three-and-a-half times less expensive to ship goods by train than by truck.



## RESEARCH PARTNERSHIPS

Canadian research resources are being called upon more and more to work on certain aspects of projects undertaken by research institutes in Third World countries. The following is a sampling of the type of co-operation established between research institutes in Québec and research teams in the Third World through IDRC's Co-operative Programs Division.

**Tunisia** – During the 1970s, the Tunisian economy experienced strong growth based on its petroleum resources; however, these resources are dwindling rapidly and Tunisia needs to plan a new strategy for economic development. To this end, the University of Montreal will be lending its assistance to the Institut d'économie quantitative de la Tunisie (Tunisian institute of quantitative economics) in order to formulate economic development hypotheses for the postpetroleum future.

**India** – Hundreds of different languages still thrive in India, but linguistic pluralism poses serious problems in such areas as education and literacy. The International Centre for Research on Bilingualism at Laval University in Québec City and the Indian authorities responsible for the decennial census will be working together to gather fresh data on language use. The research will enable the Indian government to achieve better planning in the areas of education, teacher training, and literacy.

**Jamaica** – Sharing second place in Jamaica's economy after agriculture are bauxite mining, alumina

production and, tourism. The process used to extract alumina, however, has a disadvantage in that it produces large quantities of waste, a caustic "red mud" that is harmful to humans, animals, and plants. At the current rate of alumina production, it is estimated that the area needed to store this waste will continue to grow by three square kilometres a year. For an island country the size of Jamaica, this may mean a serious loss of productive agricultural land, thus affecting another mainstay of its economy. The University of the West Indies and McGill University are therefore carrying out a more detailed analysis of the characteristics of red mud in order to develop methods of eliminating it.

**Senegal** – Until 1980, the existence of peat in Senegal was completely unknown. But since the discovery of this potential energy source, a development project has been established in the Niayes region. Indications of peat have also been found in other regions. The Senegalese government has decided to call on Canadian expertise to evaluate the energy development potential of this resource. Consequently, the Société d'Ingenierie Cartier Ltée (Cartier Engineering) of Montreal will be collecting data and conducting evaluations for the Compagnie des tourbières du Sénégal (Senegalese peat company). In addition to permitting the Senegalese government to make more informed decisions, the co-operation project will help to strengthen local expertise in this area.

different gauges of railways, ranging from one metre to 1.6 metres in track width.

### ROADS TO THE FUTURE?

Although the researchers tend to favour rail transportation, the fact remains that in Brazil 70 percent of the goods are transported by truck. According to the research group, this is an exceptional case, contrasting with most other countries, where rail and marine transportation usually predominate. This emphasis on trucking means a heavy demand for petroleum derivatives, "which largely explains Brazil's dependence on crude oil imports," says the team. Once again, the problem is a historical one. At a time when "black gold" was relatively inexpensive, Brazil, the world's fifth largest country, embarked on highway development projects of unprecedented scale. A few years later, the energy crisis hit — and hit hard. The Brazilians set to work and came up with a new fuel: alcohol. However, as Prof Pizzalotto observes, "alcohol can only be used in

light vehicles." Even today, half of Brazil's foreign currency goes to petroleum imports. "We are conducting research to develop a type of fuel from heavy vegetable oil, but the results to date are uncertain."

Trucking also provides a livelihood for some one million Brazilians. "We have to examine the effects of any shift in policy," says Jean-Marc Rousseau. "Increasing the capacity of the railways will have a definite effect on employment. There are social implications to be considered too."

The competitiveness of cargo transport by ship — another piece of the transport puzzle — has really suffered. "At the present time, we don't have adequate loading equipment in the ports," notes Prof Rousseau. "Some of the harbours need to be deepened in order to accommodate larger modern vessels." Prof Pizzalotto points out that "it might have been interesting to use barges to transport goods by river to the ocean ports — if only the rivers flowed in the right direction."

### A SYSTEMATIC APPROACH

To simplify the task, the team of researchers has concentrated on the southeastern region of the country, partly because the most accurate data available is on this area, and partly because two-thirds of the country's products are transported through it. "But we're keeping a multiregional perspective," insists Prof Florian. The project's computer modelling will be based on a simulation of Brazil's transportation system as a whole.

"Possible changes in the railway, trucking, and port infrastructures will have a direct impact on the development of each of the regions," claim the researchers. But which means of transportation should receive primary attention? "Simulation" and "approach" are the key words in this Canada-Brazil project. Because of the broad range of information to be collated, the group is storing data and mathematical models in a bank. Software will then be developed to manipulate this data bank and create simulations of transportation systems. The advantage is that the software will be transferable from one computer to another and thus from the University of Montreal to the university in Rio. "In the final analysis," says Prof Florian, "it's not up to us to impose solutions. Once we've provided a method for evaluating the strategic options, the Brazilians can choose their own scenario."

Established in conjunction with Rio Prof Luis Gomez, the three-year project will wind up in April 1985. At that time, the researchers hope that the strategic planning tools they have developed to evaluate changes in the transportation system and their impacts will enable a successful overhaul, and bring Brazil's transport out of the last century and place it firmly in the next. □

*Raymond Lemieux is a freelance journalist with a special interest in development.*

### HAPHAZARD DEVELOPMENT

On a map of Brazil, the railway network stretches like a spider web into every corner of the country. Placed end to end, the track would extend nearly 30 000 kilometres, enough, almost, to circle the world. "At the turn of the century, the country had the third most extensive railway in the world, despite the fact that it didn't produce a particle of steel," notes Prof Florian.

There is, however, one major problem. The railway's historic development was haphazard, dictated solely by the industrial interests of an earlier period. The result: "There is absolutely no integration. You can't really call it a railway system as such," contends Nelio Pizzalotto, a Brazilian researcher involved in the project. "Each industry built its system independently, for the transport and export of its own mineral or agricultural products." When these industries collapsed, they sold all their supporting transportation networks to the Brazilian government — problems included. There are, for example, three





# TRAINING THE ELECTRONIC TURTLE

ALIOU BARRY



**S**enegal does not want to be left behind in the computer revolution. The West African country was one of the first on the continent to introduce computer technology — in administration, for example — and now is seriously examining the potential applications of computers to education.

A major experiment in this area had its beginnings in January 1982 when a multidisciplinary team of Senegalese professionals went to New York to learn about a new technique in self-teaching via computer. The group, composed of a computer specialist, a mathematics professor, an educational psychologist, a sociologist and two teachers, was sent under an agreement involving Senegal's Secretary of State for Scientific and Technical Research (SERST), the Ministry of Higher Education, and the Ministry of National Education. IDRC supported the study visit. They worked with computer scientist Prof Seymour Papert, the creator and developer of an educational computer language called LOGO (see box).

After returning to Senegal, the team began its computer learning project in March of the same year at the École normale supérieure de Dakar, a training institute for teachers and teaching inspectors. The subjects of the experiment, pupils aged 7 to 11 from three schools in the Dakar area but from a variety of social backgrounds, attend three two-hour computer sessions per week.

After being taught the standard keys, the children are left to their own designs. With LOGO, the pupils program the computer themselves; in effect, they use trial and error to instruct the computer what to do, in the process teaching themselves a variety of concepts such as geometric relations. Every week members of the training team note any problems the children have in mastering the keyboard, the rate at which they learn mathematical procedures, and the programs they have created.

The pupils do not have much to say when one questions them. They are absorbed by their work and their reactions to it range from amusement to consuming passion. In the beginning, it was noticed that geometric problems engrossed the children's attention; now this kind of activity is rapidly becoming more complex as they associate elementary shapes such as triangles, and rectangles to make houses, trucks, masks and so on. In every case, success is achieved only after a significant number of errors have been made. Error rates decrease, however, as training proceeds.

After one year, the training team observed a greater mental alertness in the children with well-to-do backgrounds. However, the other pupils, even those from very poor families, eventually caught up and, according to one team member, are achieving the best results now. Regular teachers



have found that pupils participating in the experiment have improved in mathematics and, above all, are more curious in the classroom.

One curious thing about the experiment is an observed difference between the performance of girls and boys. The most satisfactory results have been observed among the girls. The experiment even brought to light the fact that one 8-year-old female participant was exceptionally gifted.

The short-term objectives of the experiment, according to SERST, are to record each child's achievements and the knowledge essential to them, and to analyze how this knowledge is used and formulated by children of the same age and of different ages. Another task will be to identify the pedagogical concepts at work in this learning process and to derive from them a body of knowledge that is indispensable for a particular age or level of achievement.

## MISTRUST

As with any novel experiment, LOGO has met with and continues to meet with mistrust. Some people are worried about the future of Senegal's children who, as one teacher put it, "are fed everything that comes along without any thought being given to the priorities of the Senegalese school system or the conditions under which it operates." This teacher bases his concern on a number of teaching experiments in Senegal that were resounding failures. There is also the case of the unfortunate experiment in educational television in neighbouring Ivory Coast. The teachers say that more precise objectives must be determined for the project and, above all, that other ministries become involved through the creation of a steering committee.

Some teachers are also concerned about their professional fate and possible loss of authority. Says one teacher: "Computers have a one-way relationship with the student that is based on an erroneous idea of learning and education."

It is especially important that the costs of an eventual extension of the computer experiment to the rest of Senegal not exceed the costs of the country's present school system — which is already too expensive. According to some, cost will be the critical factor in the future, even if the price of computers continues to drop.

The objective of SERST is not to introduce this method hastily. Rather, it is conducting a research project with all its stages: evaluation, development, and general dissemination. SERST's task is to determine *how* to introduce computer systems into teaching, for the belief is that "whether we like it or not, they *will*, sooner or later, be introduced." The Senegalese authorities feel that the computer method must be studied now through experimentation as is being done in the developed countries, which are themselves only at this stage. They insist that Senegal,

having missed the industrial revolution, must not miss the computer revolution.

With this in mind, the Senegalese are setting up an institute for research in applied mathematics and computer science. The project, now under way at the University of Dakar, began with the installation of a microcomputer systems laboratory equipped for software adaptation work. It was in this lab that the "primitives" (or elementary instructions) of the LOGO computer language were translated into Wolof, one of Senegal's six national languages. LOGO will also be translated into the other five.

The experts feel that the greatest handicap for the Senegalese experiment in computer-assisted education is the lack of specially adapted software. The experiment is being conducted with software designed by people from another culture. Even worse, according to a young Senegalese man who designed an office microcom-

puter, is that one almost has to design software for each student. Or, if not for every student, at least a large number of software programs would have to be designed. For the moment, the experiment in self-teaching continues — but with extreme caution. Whether Senegal is ready to expand such computer applications cannot be decided before the multidisciplinary team completes its work.

Africa, and Senegal in particular, criticize the West for a lack of interpersonal communication. The main worry with regard to computers is that their widespread introduction might lead to less communication. There is fear that ability to communicate — said to be one of the riches of the continent — might be threatened by this machine, the computer. □

*Aliou Barry is a journalist with the Dakar daily, Le Soleil, and is treasurer of the Association internationale des journalistes scientifiques africains.*

## A TURTLE FOR YOUR THOUGHTS

According to the noted Swiss psychologist, Jean Piaget, children are the architects of their own knowledge and the learning of their mother tongue illustrates this. It is this innate gift of learning that computer scientist Prof Seymour Papert of New York has called "learning without teaching."

According to Papert, there is a "contradiction" between the human facility for learning language spontaneously and the inability of pupils to learn spontaneously in the classroom. On the basis of this contradiction, Prof Papert designed a computer language for children, known as LOGO. It enables the children to converse with an abstract turtle, represented on the computer screen by a small triangle that can be called up by hitting two specified keys. The child gives the turtle orders, i.e. programs it, and the turtle carries out the instructions if it receives enough information from the child. When the machine executes the instructions, images recognizable and meaningful to the child are produced.



AV 38  
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Bouana Gaye, director of the research centre of the École normale supérieure de Dakar and head of the Computers in Education project in the Senegalese capital, describes LOGO this way:

"Children in contact for the first time with the turtle discover how they can animate it by typing commands to it on the keyboard. For example, typing the words 'ADVANCE 100' makes the turtle move 100 steps in a straight line, with each step measuring about 1 mm. 'RIGHT 90' tells the turtle to make a 90° right-hand turn. The pupils do not understand right away what the commands mean and they must make several attempts before they fully comprehend. But they are captivated by this kind of learning and are eager for repetition.

"With LOGO, programming the computer amounts to little more than teaching it a new word. Right from the beginning, children usually invent new words or variations of words for the computer. 'SQUARE' and 'TRIANGLE'; for example, might be written 'SQUA' and 'TRI.' These words enter the computer's memory and become points of departure for increasingly complex projects. Combining SQUARE and TRIANGLE produces 'HUT.' The child will try to put the TRIANGLE on the SQUARE. He or she will do it very naturally, but might unintentionally produce a HUT that is 'lying down' rather than 'standing up.' This is a bug or error, but a constructive one. Instead of inhibiting the child, as may be the case with traditional educational practices, the bug acts as a catalyst in the research the child is doing to carry out the project."



# ETHICS IN HUMAN RESEARCH

ROBERT CHARBONNEAU

**T**wo million women in 80 countries across the world receive an injection every three months for birth control, a method that has been in use since 1967. Although considered as effective as oral contraceptives (with which it shares the same side effects), the drug used, Depo-Provera, has not yet been approved by the American Food and Drug Administration (FDA).

And with good reason: in still controversial studies, the experimental injection of Depo-Provera in dogs and monkeys caused various types of cancers. The product's manufacturer, the Upjohn Company, has taken action to appeal the ban imposed in 1978 by the FDA. According to observers, the company, which is seeking to consolidate its Third World markets, needs the approval of the American watchdog agency to be able to expand Depo-Provera's distribution abroad. Developing countries have few legal barriers to the importation of medication or drugs and must rely on world-recognized organizations, which is why they require official FDA rulings on product safety.

Despite the refusal of the FDA to clear it for use in North America,

Depo-Provera continues to be administered in many developing countries. International institutions, including the World Health Organization and many local governments, support its use although not one thorough study has been conducted on the ten million women receiving this contraceptive since 1967.

In effect, an experiment involving millions of women is underway in developing countries — one that would not be permitted in the country where the drug originates.

## INFORMED CONSENT

It was after the Second World War that people in the developed countries became concerned for the first time with drafting a code of ethics for human experimentation. The abuse of prisoners in concentration camps led to the Nuremberg Code, which set forth the basic principles that researchers were to observe when experimenting on human beings.

First of all, the Code states that researchers must obtain the informed consent of the subject. The latter must be advised of the nature of the research and of its objectives; he or she must also be able to

evaluate the risks and the benefits, if any, of his or her participation in the experiment; finally, he or she must give written consent — although retaining the right to withdraw at any moment if he or she sees fit. The Nuremberg Code was largely responsible for the Helsinki Declaration (1964, revised in 1975), the most widely recognized and most recent code. A clinical section was added to deal with relations between patients and health professionals.

The Helsinki Declaration recommended the creation of ethical advisory committees within medical research institutions and hospitals. These watchdog committees would evaluate the implications of and, where necessary, sanction research conducted by institution staff.

In practice, ethics committees in the West have not always lived up to their responsibilities. A study conducted in the United States showed clearly that decisions made by ethics committees varied considerably from one institution to the next. Medical acts or research considered morally acceptable in one institution were very often condemned in another.

Informed consent of the individual, the cornerstone of all Western ethical codes, is often difficult or even impossible to transpose, given the circumstances of developing countries.

What is the meaning of "informed consent" of the individual when the advantages are incomprehensible and the risks untranslatable, when the very notion of science is foreign to the individual? How can the researcher go beyond the simple explanatory text, the words of which may be translated, to obtain informed consent when clinical research is a Western reality without indigenous equivalents?

The subject's consent should also be understood in social and economic terms. Confidence in the doctor sometimes outweighs a rational analysis of the drawbacks or advantages of participation in the experiment. In some cultures, individual informed consent of the subject is not enough, as an entire network of social relations may be involved: the spouse, the patriarch or



*Third world researchers are not always the first to defend traditional moral principles.*



the tribal chieftain may be called upon for their opinion and consent. Some researchers argue that the consent of a tribal chieftain is sufficient to use an entire community in an experiment. Others are categorically opposed to this easy way out which, for the sake of research, disregards the individual's freedom and rights.

Ethical codes, conceived in and for the West, insist that the consent of the individual be obtained in writing. This method is impractical, given the chronic illiteracy of so much of the Third World. As a solution, researchers have proposed that information be given orally in front of a witness and that the consent be recorded on paper by fingerprints. Despite the good intentions behind this proposal, there is still the risk that the oral agreement will not coincide with the written document.

Furthermore, the subjects of experiments are somewhat reluctant to sign papers. It is easy to understand that many do not want their names on file, especially in totalitarian countries. Too often, experiments have been carried out disproportionately on groups hostile to the political power of the day.

## CULTURE

Western researchers involved in Third World research face a host of problems for which they are ill-prepared. Dr David Roy of the Bioethics Centre (Montreal, Canada) believes that ethics should be based on living people, not universal principles. "Medicine is not a neutral science, free of values and restricted to the physiological plane of human existence. Health, well-being, disease, illness and deformities result from the importance and priority that society places on them. Human values, individual as well as social, are an integral part of medicine."

When a study is conducted jointly by Third World and Western researchers, the latter tend to defer to their Third World counterparts in ethical matters, overlooking the fact that most Third World researchers were trained in Western countries, where they often adopted the codes and basic ethical principles of a foreign culture. As a result, Third World researchers are not always the first to defend the traditional moral principles prevalent among the people to which they themselves belong.

Nonetheless, much research conducted in the Third World under the auspices or with the technical and financial aid of Western institutions continues to be based on traditional codes of ethics.

Yet researchers should not feel stymied when confronted with the complex problems of ethics in Third World research. Scientists interested

in ethical issues agree that it is not enough to translate the information necessary to consent into another language; much more is in fact required. The quest for informed consent is a long and difficult undertaking, fraught with cultural, hence systemic, misunderstanding.

A number of specialists, including S. Ofofu-Amaah, an African researcher, recommend that Third World countries set up national research councils to evaluate research projects conceived abroad. At the moment, the practice is far from common, although the United Nations Conference on Science and Technology held in Vienna in 1979 recommended such councils and the World Health Organization has proposed that national medical research councils be established. These bodies would constitute national ethics committees responsible for ensuring that research is carried out in a manner respectful of the individuals concerned.

Arthur Kleinman, author of several works on ethics, proposes that rather than concentrating on supposedly universal moral codes, clinical

are often poorly understood in developing countries, even by the governments supporting them. Punitive legislation and coercive and oppressive ways of applying family planning policies in developing countries no doubt stem from good motives, but they are difficult to defend from a purely ethical standpoint.

In addition, scientists know full well that the opposition of local leaders can stall research, and those who know the Third World know where to turn to ensure the survival of their programs. But are they aware of the consequences of their wheeling and dealing? Multinational pharmaceutical and medical equipment companies may be tempted to carry out research in the Third World that would not be tolerated in the West because of stricter laws.

Ethical questions are also raised by marketing practices. Medication that is prohibited in the West is sold freely in developing countries, where pharmaceutical companies can find populous markets for their products. Furthermore, they do not hesitate to change the explanatory folders,

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*"Human values, individual as well as social, are an integral part of medicine."*

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researchers should work with anthropologists studying the same societies. In this view, practical cooperation between these two disciplines is more likely to resolve ethical problems than are philosophical debates on moral and legal codes for universal application. He maintains that international organizations financing research should encourage the preparation of ethnographic bibliographies and practical guides to various traditional societies to aid researchers. He also maintains that negotiations with representatives of native groups should be included, to ensure that problems are detected and resolved quickly.

Where appropriate, public debate with researchers present may be a means of obtaining the consent of a community and coming to grips with the cultural barriers of native peoples. The media (radio, press, television) may be of help in reaching this objective.

Mistakes due to differences in value systems illustrate the importance of ethical precautions. Researchers must not only find out about the traditions of the people who are the subject of their clinical experiments, they must also be aware of conflicts of interest. Scientists must become attuned to the economic and political context in which their research takes place. Family planning research programs

dosages or contraindications to expand their products' use in the Third World.

Drugs are often tried in the Third World to dodge the strict requirements of the West. Western countries will grant patents for drugs tested abroad without requiring that any ethical protocol be respected — thereby becoming an accomplice to research that is considered hazardous by domestic standards.

Few researchers can state that they have never faced conflicts of values in their work. Research is subject to power, and as Dr David Roy notes, "power, whether economic, political, scientific or technological, always raises a series of questions. The last is inevitably moral. Yes or no, when and how, for or against whom will this power be used and what will be the short- and long-term consequences?" With no solution at hand, scientists must attempt the impossible to take into consideration the cultural and social differences of the environments in which their research is conducted. Dialogue and, above all, respect for one's fellow humans, are no doubt the only guarantees of morally acceptable research, for both the populations concerned and the researchers themselves. □

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*Robert Charbonneau is an interpretive writer in IDRC's Communications Division.*



## PROMOTING THIRD WORLD AGRICULTURE LESSONS OF RECENT EXPERIENCE

CHRISTOPHER D. GERRARD

It was widely perceived among development economists in the early 1970s that industrialization based on import-substitution policies could well produce short spurts of rapid growth, but that this was not likely to improve the lot of low-income groups engaged in agriculture and the urban informal sector. The key to reducing poverty was to provide productive income-earning opportunities to the poor. Particularly in agriculture, this was a complex task. But it would not only reduce poverty; it would contribute positively to economic growth. "Without rapid progress in small-holder agriculture throughout the developing world, there is little hope either of achieving long-term stable economic growth or of significantly reducing the levels of absolute poverty," said Robert McNamara in his seminal address to the Board of Governors of the World Bank in Nairobi in 1973. Development assistance should therefore emphasize agricultural development and other programs to increase the income-earning opportunities of the poor, he said.

The World Bank and other major Western donors subsequently reoriented their development assistance strategies in a remarkably consistent pattern in the early 1970s in favour of broadly based agricultural development. The new strategies represented a major reversal from approaches that had dominated development thought and action since the end of the Second World War. Previous strategies had emphasized investment in the modern industrial sector and had argued that the benefits of such investments would eventually "trickle down" to the agricultural sector. They viewed the agricultural sector as a holding sector, weighed down by surplus labour whose product was negligible, and not as a major source of economic growth in its

own right. The growth of the industrial sector would and could absorb this surplus labour without resulting in significant declines in agricultural production.

These strategies came under increasing attack in the 1960s. Industrial development was not trickling down. Industrial employment did not expand as rapidly as predicted. Agricultural labour was not surplus. Instead, lack of agricultural development



*Industrial development benefits have not "trickled down" to the rural poor.*

constituted a major bottleneck to overall development as domestic food prices rose or food imports increased. More and more, development specialists viewed the agricultural sector not only as a potential, but also as a necessary, source of growth in predominantly agrarian societies. They drew renewed optimism from the possibility of agricultural development resulting from the introduction and spread of new agricultural technology in South Asia.

The new strategies gained strength from the world food crisis of 1972-74, and they contributed to the "basic needs" approach to development, which was endorsed at the World Employment Conference of 1976. This approach seeks to mobilize a developing country's most

abundant resource, its people, in trying to meet its basic needs. It contains some fundamental democratic assumptions about the rights of people to make their own economic decisions and to participate meaningfully in the political processes that affect their material well being. The major donors broadened their development assistance strategies after 1976 to incorporate basic needs and to support more explicitly the participation of the poor in the development process.

The new development strategies brought forth a burst of activity in the mid-1970s. The major Western donors increased their support for agricultural development, in real terms and as a share of total development assistance. The largest increases occurred in 1974 and 1975 at the time when the donor agencies were announcing their new development strategies and when they were most concerned about the world food crisis. Since 1978, support for agricultural development appears to have leveled off.

### SCALING DOWN EXPECTATIONS

Broadly based agricultural development is a slow and complex process that will take longer than was reflected in international expectations of the mid-1970s. But it is possible that it will contribute

positively to overall economic development. With due allowance for risk, small farmers are responsive to opportunities to improve their income, whether by means of higher prices for agricultural products or more productive technology.

The availability of new technology that genuinely improves small farmers' productivity and income and is appropriate to the risks and constraints they face has been crucial to these successes. The improved technology did not appear overnight, but resulted from initial investments two or three decades ago in long-term agricultural research programs on major crops in each location. Positive research results and applications largely explain Asia's relatively successful production record of the 1970s. Lack of adequate research results in



Africa, except for some coastal areas of West Africa and the volcanic highlands of East Africa, helps to explain why per capita agricultural production has declined in Africa over the last two decades. Clearly, governments and donors need to do much more in this area before the declining trend in agricultural production will be reversed.

Donors have faced other difficulties in supporting broadly based agricultural development. They have generally incurred greater administrative costs compared to more conventional projects. Agricultural projects are more experimental and largely non-replicable. Each is a separate learning experience, particularly with respect to the development of technology and the building of institutions. One must learn about the rural environment, analyze initial results, and train staff before moving on to later, more ambitious stages of each project. Ways of reducing administrative costs include relying more on the private sector for activities that it performs well, decentralizing decision making within the government administration, and channeling more assistance through NGOs (nongovernmental organizations), both indigenous and international.

#### WORKING THE SYSTEM

The donors found that recipient countries often lacked the administrative capacity to implement agricultural projects, in large measure because these were aimed at target groups previously outside the scope of existing government programs. Therefore, they frequently established autonomous authorities to implement projects. They also sponsored integrated rural development projects that attempted to provide both agricultural development activities and rural public services in a co-ordinated manner. Both of these approaches have been found wanting.

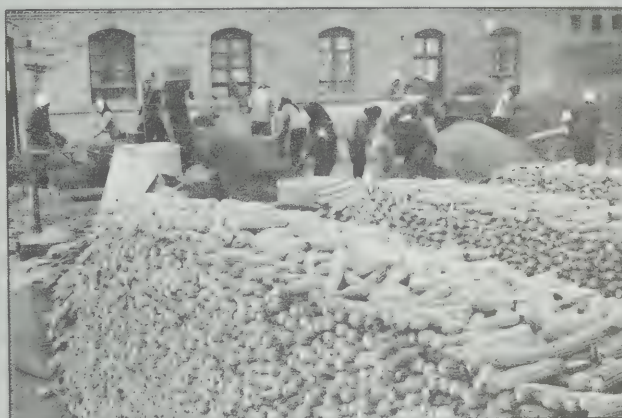
If governments and donors are serious about long-term agricultural development, there appears to be no substitute for improving the effectiveness of government agencies dealing with the agricultural sector. Autonomous authorities may have actually weakened the government's overall administrative capacity by absorbing excessive resources and administration. Integrated projects are utopian. It is beyond the capacity of most planners to think through the interaction among the various activities and coordinate their progress over time. It is also difficult to get different ministries of the recipient government and different departments of the donor agency to work together in one project. Smaller projects focused on one aspect of agricultural or rural development

tend to yield higher returns, if only because they are easier to implement.

The basic needs approach to development is right to emphasize the participation of rural people in their own development, but it has become a slogan for greater equality in the distribution of the benefits of economic development. It may have made it more difficult for bilateral donors, in particular, to justify support for public sector activities such as agricultural research, transportation infrastructure, and development administration. It may also have reduced the emphasis on directly productive activities like agriculture that are required to sustain public services like water, sanitation, education, and health over the long term.

The donors' experience with autonomous implementation authorities and integrated rural development also reflect badly on what the basic needs approach to development has become. Bilateral donors are constrained by the three

agricultural development are political as well as technological. In the non-socialist countries of Asia, governments have been more supportive of agricultural development. They have invested in agricultural research, education, and infrastructure. They have pursued more remunerative pricing policies in the 1970s than those of Latin American and African governments. In stark contrast to Latin America, the development in Asia of the new agricultural technology — which is scale-neutral, labour-intensive, and land-augmenting — has brought many small farmers into the development process as well as increasing food grain production. That the favourable production experience has just begun to make a dent in rural poverty should not be blamed on the technology, but rather on institutions such as land tenure arrangements, that channel the benefits of the technology in favour of some groups over others. Even if agricultural development takes place equitably, the pressure of population



*New agricultural technologies improve small farmers' productivity.*

major domestic constituencies that they serve: political, commercial, and humanitarian. The Third World lobby — which promotes humanitarian and developmental concerns — may have hamstrung donors' support for certain public sector activities like research, transportation, and administration. The commercial lobby has succeeded in maintaining tied aid at high levels. This imposes a significant constraint on donors' support for agricultural development activities because agricultural projects are less capital-intensive than more conventional projects and require fewer capital imports from donor countries. The political lobby has directed support for agricultural development away from politically sensitive countries such as those in Central America. Successful agricultural development entails definite political risks. It involves the fundamental transformation of rural societies, which frequently generates opposition to existing political authority.

#### POLITICAL CONSTRAINTS

Constraints to broadly based

is simply so great that it will take time to bring about major, observable increases in income among those remaining in the agricultural sector.

Most governments still view the agricultural sector as one that supplies resources — labour, savings, and foreign exchange — to be taxed in order to support industrial development, without helping the agricultural sector to supply these resources. Many appear unconvinced that broadly based agricultural development is possible or even necessary for overall economic development. □

*Christopher D. Gerrard, professor of economics at the University of Saskatchewan (Saskatoon, Canada) draws on the experience of studies in development and agricultural economics and field research in Africa for this commentary. It is excerpted from a longer study, Promoting third world agriculture: lessons of recent experience, published recently by the North-South Institute, a nonprofit corporation established to provide policy-relevant research on issues of relations between industrialized and development countries (185 Rideau Street, Ottawa, Canada K1N 5X8).*



## Fluoride toothpaste in Kenya: the problem is not cavities

There is a toothpaste debate going on in Kenya. And it is not about cavities. While Europeans and North Americans enjoy the well-founded benefits of fluoride toothpaste, its vigorous promotion by foreign multinationals in this East African country may be creating a major health hazard.

People in many regions of Kenya get too much fluoride, mainly from natural sources such as water and food. Using fluoride toothpaste is like "adding fuel to fire," warn concerned researchers at the University of Nairobi.

The Kenya Dental Association, whose activities are funded in part by a fluoride toothpaste manufacturer, has been publicly endorsing the product. The association's chairman, Dr G. Owino, argues that "dental caries are on the increase in Kenya and, to date, fluoride is the only accepted anti-caries agent that dentists can use."

Many of his colleagues disagree. They maintain that with about 60 percent

of the population suffering from some form of fluorosis, a disease caused by an excessive intake of fluoride, the use of fluoride toothpaste is hardly in the interests of public health.

The presence of endemic fluorosis in eastern Africa is now well established. The condition is associated with the drinking of groundwater in regions with volcanic rock containing high levels of soluble fluoride salts.

The countries that are most affected by endemic fluorosis lie within Africa's Great Rift Valley. They include Kenya, Tanzania, Uganda, Ethiopia, the Sudan, Rwanda, Burundi, and parts of Zambia, Mozambique, and Zimbabwe.

The fluoride toothpaste debate has been the focus of public attention for more than a year in Kenya. The ministry of health recently banned the advertising of toothpaste containing the additive. Until December 1982, only fluoride toothpaste was available in Kenya.

According to Dr K.R. Nair, co-author of a major report on fluoride in rural water, the advertising campaign mounted by

toothpaste manufacturers had, until recently, convinced Kenyans that it was necessary to use fluoride toothpastes to have strong, white teeth.

Even a slight excess of fluoride will lead to yellowing of the teeth. At higher levels, tell-tale grey patches appear and the enamel of the teeth fractures. And at higher levels yet — in the range of 40 milligrams a day — the spine may become calcified, causing crippling.

It has been found that as much as 30 percent of the fluoride in toothpaste may be absorbed by the body. And it has also been documented that children are particularly vulnerable to fluorosis when teeth are being formed, and because they like to eat large amounts of the sweet fluoride toothpaste.

With a grant from IDRC, the University of Nairobi and the Ministry of Water Development have collected data from over 29 000 people and 1200 samples of water from boreholes, and have documented the seriousness of endemic fluorosis in Kenya.

It is expensive to remove excessive fluoride from drinking water. A pilot defluoridation plant built recently in Kenya cost over KShs 2 000 000, (CA\$20 000) and operating and maintenance costs are also high.

Another IDRC-sponsored project in India experimented with simple defluoridation techniques, such as the addition of sodium aluminate, lime, or alum to the drinking water. These cause fluoride compounds to coagulate into heavier aggregates which are then readily

removed by sedimentation and filtration.

Research in Kenya so far shows that locally available materials such as clay, carbonized coffee husks, and bone meal have good potential as defluoridation agents. The use of clay pots in the home may also help resolve this major public health issue. *Fibi Munene.*

## Salubritas is back

*Salubritas*, the highly acclaimed quarterly newsletter on primary health care in developing countries, has resumed publication after a year-long suspension, thanks to contributions from individuals, organizations (including IDRC), and industry. The decision was made after hundreds of positive comments received in response to a questionnaire confirmed that the newsletter meets a real need for concise, readable, up-to-date information on primary health care.

The newsletter will continue to offer the same popular mixture of features, "how-to" articles, readers' exchange, and information on publications, training courses, workshops, and other resources.

Subscriptions to *Salubritas* can be obtained in English only at an annual rate of US\$10.00 (US\$8.00 for bulk orders of five or more) by contacting Anita Y. Askew, *Salubritas* Business Manager, American Public Health Association, 1015 15th Street NW, Washington, D.C. 20005, USA. Organizations are encouraged to support the newsletter by purchasing bulk subscriptions for their field staff.

Fluoride damage: high levels can cripple.

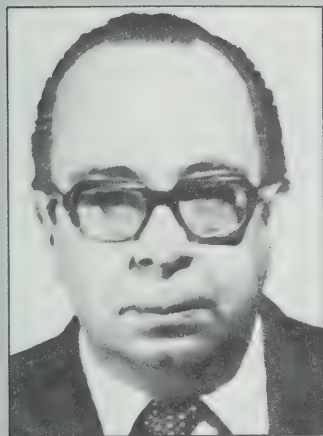




**Beltran wins McLuhan Award**

Luis Ramiro Beltran, a Bolivian-born journalist and one of the most respected communication scholars in Latin America, has been selected as the first winner of the McLuhan Teleglobe Canada Award. The award was established in 1983 — World Communications Year — to honour exceptional contributions to a better understanding of the influence of communications media and technology on society.

Early in his career, Dr Beltran became one of Bolivia's foremost journalists. In 1953, he joined the Information Department of the Inter-American Agricultural Service (SIA) and, in 1955,



*Luis Ramiro Beltran*

joined the Inter-American Institute of Agricultural Services (IICA) in Costa Rica. By 1964, he had acquired an international reputation as a teacher, adviser, author, and communications specialist, having trained some 300 communication specialists and some 2000 agricultural development professionals in many

Latin American countries. His doctoral thesis on communication in Latin America was the first overall critical study of its type.

Since 1974, Dr Beltran has worked for the IDRC in its Latin American Regional Office in Bogota, Colombia — first as Information Science Representative and then as Deputy Regional Director — and has been a member of several world-wide and regional organizations.

But Dr Beltran's activities in the field of communications are not limited to those of a scientific nature. Last year, Dr Beltran compiled and annotated a 700-page anthology of Bolivian poetry. The anthology includes poems from each of the country's three major languages — Quechua, Aymara, and Spanish — from pre-colonial days up to the present.

**Science education proceeding at snail's pace**

Almost all Asian countries recognize that science education plays a vital role in development. Indeed, since the early 1970s, the aim has been to make learning science as natural as learning one's native language. But there are serious obstacles to be overcome in the realization of this aim: shortages of qualified science teachers, overcrowded classrooms, lack of laboratory facilities, and, in some cases, problems with respect to the language of instruction.

These are among the findings of a review based on 22 national studies received by the UNESCO Regional Office for

Education in Asia and the Pacific. The review, which was released late last year, looks at what is being taught, how it is being taught, and by whom it is being taught.

All 22 countries reported that science is an integral part of the education curricula, taking between 5-20 percent of instructional time. The goal of science at the elementary level is seen not so much as to impart knowledge as to develop inquiring minds and problem-solving skills. High school science, on the other hand, tends to be much as it was decades ago — academic, subject-oriented, and catering mainly to the interests of the small group of students who will continue their studies at the university level. Moreover, the unprecedented expansion in the number of high school students in recent years has put a severe strain on teaching resources and facilities.

**Indonesia manages its environment**

Indonesia is surely one of the most ecologically and culturally diverse nations in the world. Environmental concerns range from basic land and water use through industrial waste disposal, to the protection of heavily exploited forest and ocean resources. Because of this, and because the information base for environmental activity is still relatively small, Indonesia has taken a unique approach toward environmental assessment and management.

Responsibility for the conduct of environmental work rests with the Minister of State for

Development Supervision and Environment and the various government departments and provincial governments as required. But instead of having a full department of the environment, the government has chosen to develop a network of at least 15 environmental centres at universities throughout the country. University staff members will directly serve the research, training, and extension needs of the Minister of State. In effect, the government has traded off a potential large bureaucracy for smaller units that should be more knowledgeable about their specific local concerns.

In order to assist Indonesia in this major environmental endeavour, CIDA (the Canadian International Development Agency) is funding a three-year project to expand the numbers and capabilities of Indonesian personnel for environmental management — including environmental lawyers needed to administer new Indonesian environmental laws and regulations. The project will be coordinated by the Dalhousie University Institute for Resource and Environmental Studies jointly with the Ministry of State for Population and Environment in Indonesia.

**The lawyering of China**

Laws and lawyers are as scarce in the People's Republic of China as they are abundant in North America; there are a mere 7000 practicing lawyers in China compared to more than 60 000 in the United States. Traditionally, the PRC has relied on the moral authority of an austere elite, as well as



family and peer pressure, to maintain social control. The law was regarded more as a tool for reinforcing discipline than protecting human rights.

Recently, however, China has shown a strong interest in revitalizing both its existing legal system and institutions of legal education. In the past four years, China has adopted scores of statutes and regulations, including a new state constitution, and codes of criminal and civil procedure. Moreover, all citizens are supposed to be treated equally before the law; they have the right to a public trial and to be defended by a lawyer. Besides establishing more than 20 new faculties of law, China has reopened the few schools that existed prior to the Cultural Revolution.

To assist in these efforts, the Chinese have invited legal experts from the United States and other countries to lecture at law schools and to serve as consultants in legislative drafting. (*Ford Foundation Letter*)

### A natural insecticide

From chrysanthemums came pyrethrin — the active ingredient in many insecticides.

Today, researchers are attempting to isolate the active compounds in two African weeds that are traditionally used to protect cowpeas from attack by bruchid beetles.

Farmers in Upper Volta and Sierra Leone mix two local weeds — *Hyptis spicigera* ("Black sesame") and *Cassia nigrican* ("Fly's talo") — with stored cowpeas to reduce damage by beetles. Cowpeas are an important source of protein in West Africa, but their production is often neglected due to the high risk of attack by bruchid beetles, which can cause losses of up to 40 percent.

Preliminary studies have shown that the two weeds are capable of inhibiting reproduction and larval metabolism in the beetles, thus reducing the losses inflicted.

With support from the

Co-operative Programs and the Agriculture, Food, and Nutrition Sciences Division of IDRC, biologists at Carleton University in Ottawa, Canada, will conduct a study of these valuable African weeds to identify the active compounds that act as natural pesticides, evaluate their performance, and determine their safety.

If the results are positive, the way will be open to increasing the cultivation of cowpeas in West Africa and providing farmers with greater protection from one of their traditional enemies.

### ... and with a twist

Grate the skin of an orange, lemon, lime, or grapefruit and you may have a potent insecticide. Dr D. Craig Sheppard of the University of Georgia (USA) was prompted to investigate the insecticidal properties of citrus peel oil after noticing that an orange-peel-based grease remover dumped on a fire ant hill effectively eradicated all the ants.

In preliminary investigations, Sheppard noted that oil from citrus peels — which seems to be nontoxic to humans and other vertebrates — killed all insects tested. Both direct contact and exposure to vapour proved effective.

According to Sheppard, this natural insecticide — a by-product of the citrus industry — could prove valuable for ridding livestock and humans of external parasites, for fumigating food handling and storage facilities, and for pest control around households. For the developing countries — many of whom are citrus producers — the discovery holds out the promise of a low-cost, nontoxic pesticide with considerable potential for reducing food losses due to insect damage. The next step will be to isolate and identify the lethal chemical and to characterize its toxicological properties. (*Science News* 124 (15), October 8, 1983, page 231.)

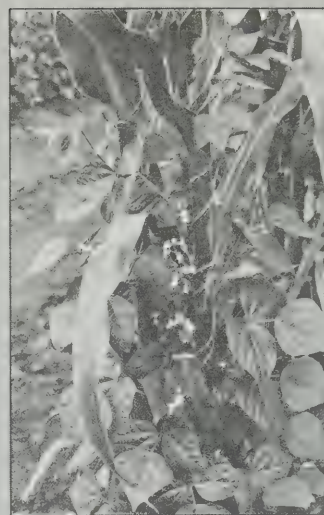
### Multiple cropping — new knowledge of an old practice

Experiments in multiple cropping in Colombia have corroborated the soundness of farmers' practices of coaxing two or more crops out of one plot of land more or less simultaneously.

A considerable body of study supporting the validity of multiple cropping has been growing since the early 1970s but not until four years ago was the practice approached from the viewpoint of preparing technical recommendations as in Colombia. With the support of IDRC, a team of experts, led by Dr Jesus Arias, the agronomist-coordinator of the Multiple Cropping Programme at the Instituto Colombiano Agropecuario (ICA), began field trials of intercropping systems using basic crops traditionally grown in the Andes — maize, plantain, cassava, sugar cane, potatoes, tobacco, and beans.

A "constant crop" model was designed, the constant being a traditional crop planted by small farmers using traditional technology. Alongside this constant, the same crop was planted together with a different species. The combined or intercrop was then compared with the traditional single crop. The trials were carried out on experimental farms and in direct cooperation with farmers in different regions, each having different climatic and soil conditions.

The Colombian team was able to prove that, aside from the benefit of having to till the soil only once, food production and quality was excellent in most cases. Moreover, the association of different crops was found to inhibit certain diseases: maize intercropped with beans, for example, reduced the occurrence of common bean diseases by 40 percent. Also, the plants grew more vigorously, a fact Dr Arias and his colleagues attribute to the nitrogen-fixation property of beans, which allows surplus fertilizing nitrogen



*Intercropped corn and beans.*

compounds to be absorbed by the maize. Excellent results were also obtained by intercropping potatoes and beans.

The advantages to the farmer of multiple cropping are obvious. Since small farmers in Colombia generally sell beans for cash income, keeping maize for their own use, multiple cropping provides them with a real opportunity to increase their incomes. Once a field has been fertilized for the production of a maize crop, it can be used to produce beans without major additional investments. Farmers can begin to produce both food and money 60 days after planting or, if they so desire, harvest three crops — maize, green beans, and dry beans. Cassava planted with beans produces similar benefits, except that the lag between bean harvest and cassava harvest is even longer, about 6-9 months.

Twenty-five percent of Colombian farmers already practice a multiple-cropping system based on their own practical experience. Agronomists are determined to conduct an extension campaign that will increase this figure to at least 80 percent, and improve techniques based on their researches with the farmers. To this end, ICA experts are preparing informative materials on the different systems of multiple cropping for nation-wide distribution.

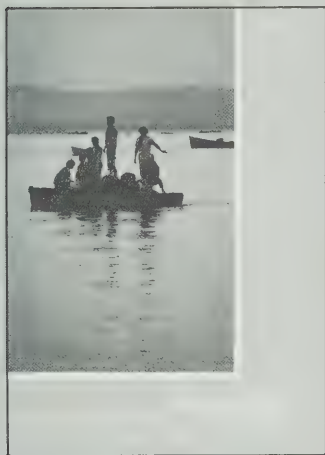
*Patricia Lozano de Alarcón*



## Searching: review of IDRC activities 1983.

Published January 1984, 40 pages, IDRC-220e.

Intended for the general reader interested in IDRC and its activities, this brief narrative gives an account of the Centre's programs over the last year. An overview of the present economic situation in the world and its impact on development and the research environment is followed by sections on Africa, Asia, Latin America and the Caribbean, and cooperation between Canada and developing countries — all focusing on the Centre's project activity. A list of publications and of the IDRC Governors, Officers, and Directors rounds out the booklet. Also available in French and Spanish.



## Rearing of marine fish larvae in Japan, by Katsuzo Kuronuma and Kunihiro Fukusho. Published in 1984, IDRC-TS47e.

An IDRC-sponsored regional workshop on induced fish breeding (IDRC-178e, Induced fish breeding in Southeast Asia) prompted considerable interest in further information on the most suitable approaches, facilities, and equipment for the improved larval rearing of many marine finfish species. Subsequent examination revealed that this information could not be found in a single text suitable for use in the developing countries. This technical study is the result of a detailed review of the literature on the subject — most of which was available only in Japanese — and

constitutes a summary account of the state of the art in induced fish breeding in Japan today.

## Educational research: the English-speaking Caribbean, by Errol Miller. Published March 1984, IDRC-TS46e.

This technical study traces the origins and evolution of educational research in the English-speaking Caribbean; explores its social and historical dimensions; examines in considerable detail the existing resources for educational research in the Windward and Leeward Islands, Bahamas, Barbados, Guyana, Belize, Jamaica, and Trinidad; and takes a look at some regional projects. The author makes a strong case for assigning higher priority to educational research than has so far been accorded it.

## Organización y conflicto: la educación primaria oficial en Colombia, by Hernando Gómez-Buendía y Rodrigo Losada-Lora. Published in 1984, 319 pages, IDRC-199s.

Although the public school system possesses one of the largest government bureaucracies, the administrative, financial, and labour aspects of education have rarely been the subject of analysis. This monograph describes a detailed study of education administration with respect to the primary level that was undertaken in two departments in Colombia. The study shows how political and administrative factors can inhibit a system's effectiveness and reveals considerable tension arising from such factors as government patronage, union demands, contradictory divisions of labour, and opposing forces such as centralization and decentralization. The case studies are Colombian, but the problems are widespread, and the book should be of considerable interest to educators and researchers in Latin America.

# NEW RELEASES

## Improving small-scale food industries.

W. Edwardson and C.W. MacCormac, editors. Published in 1984, IDRC-TS48e.

Small- and medium-sized food-processing industries are the main source of low-cost traditional food products in the developing countries. They also constitute an important source of employment and income. Several countries are now taking steps to strengthen the sector by attempting to match local skills and industry with local market conditions. A strong small-to medium-scale industrial sector is perceived as a solid basis for the development of larger-scale industry in the future. This technical study summarizes the most recent of the continuing discussions (at workshops held in Singapore in 1980, Bangkok in 1981, and Vancouver in 1983) on how industrial research and extension services can best be made available to the small-scale food processor.

## Social scientists in agricultural research: lessons from the Mantaro Valley Project, by Douglas E. Horton. Published 1984, IDRC-219e.

Social scientists are latecomers to agricultural research programs and although most members of the CGIAR network now employ economists, few have anthropologists or sociologists on staff. The exception, however, is the International Potato Centre (CIP) in Lima, Peru, which has had a "socioeconomic unit" since 1975.

This monograph

summarizes the experiences and results of the Mantaro Valley Project (1977-80) in which an interdisciplinary team consisting of biological and social scientists worked to develop and field test procedures for on-farm potato research. The anthropologist and sociologist were key elements in the approach and success of the project. Moreover, on-farm research has become an integral part of CIP's research and technology transfer system and a range of survey and experimental techniques developed during the project are routinely employed in CIP's programs.

## Aspectos relevantes de la educación primaria rural en Colombia: trabajos presentados en un seminario celebrado en Bogotá, Colombia, el 16 septiembre de 1981. Published in January 1984, 100 pages, IDRC-188s.

A seminar held in Bogotá in September 1981 brought together a number of researchers and decision makers in the field of primary education in Colombia, plus members of the national teachers' association. They met to exchange ideas relevant to some of the research that, with the assistance of IDRC, is being carried out on rural primary education in Colombia. Among the subjects covered in the various presentations, and represented in this book, were teachers' access to, and utilization of, scientific information; labour problems in the teaching profession; and financial support for education from public revenues.





In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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VOLUME 13, NUMBER 2 — JULY 1984

Government  
Publications

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**Development  
and women**

- railway impact
- farmer participation

CANADA



# LETTERS

## Rx for apathy

It is disheartening to read and hear about medical breakthroughs and at the same time witness millions of individuals in Third World countries deprived of any semblance of medical care because of government neglect and the medical profession's apathy.

Today Third World government authorities emphasize primary health care and preventive medicine yet fail to follow through once such programs are initiated. For example, the Philippines has programs sending village nutritionists and family planning motivators to the barrios armed with a "village pharmacy." Yet these personnel are handicapped once they are out on their own by a shortage of basic medicines and a surfeit of useless ones. Moreover, the bureaucracy ignores their requests (for supplies) and administers the program in a rigid fashion. The initial enthusiasm for the program dies down and it is eventually abandoned, letting down the people and wasting money that the government can ill-afford.

Of course, all programs encounter problems and difficulties, but what does one do when they are sabotaged by rumours? For example, there is a persistent false rumour — I have heard it from more than one drug company representative — to the effect that the basic medicines bought by the

Filipino government from a local drug company are diluted by placebos, thus making the dosage ineffective.

Another problem is inappropriate prescribing. In an urban squatter relocation centre, I encountered a case where a woman with a sty in her eye was prescribed 1500 milligrams of an antibiotic for seven days, a treatment costing almost a hundred pesos. The woman clearly could not afford this — she had had to borrow transportation fare just to get to the clinic! It bothered me that the doctor knowing her financial straits, did not offer an alternative treatment.

It has been recognized that folk medicine has its merits, not the least of which is that it is cheap and available to everyone. Third World governments should undertake programs to study the pharmacological properties of known medicinal plants in their respective countries. These might lead to the manufacture of medicines using these plants as bases and would help reduce their dependence on medicines purchased from transnational drug companies.

Clearly, there needs to be a realignment of values on the part of those who administer the medical needs of a country. Follow-up of medical programs should be continuous. Too often government programs fail because apathy sets in,

and what is the solution for apathy?

Henrietta Fajardo  
Researcher  
College of Public  
Administration  
University of Philippines  
Manila

## Editor's note

Next year is the end of the United Nations Decade for Women. As the Decade draws to a close, interest in research related to women is becoming more and more a current preoccupation. The interest is growing in proportion to the emerging symptoms of a new malady in developing countries: the loss of power and impoverishment of women produced by national and international development programs.

In this issue we have attempted to further a little the understanding of some of the research related to women, and what it has revealed about development. Concern for women's issues in development cannot be neatly limited to one decade. Nor can the concerns for women in development be divorced from the complex process of development as a whole. But a better understanding of the role and status of women will contribute to a more equitable development for all.

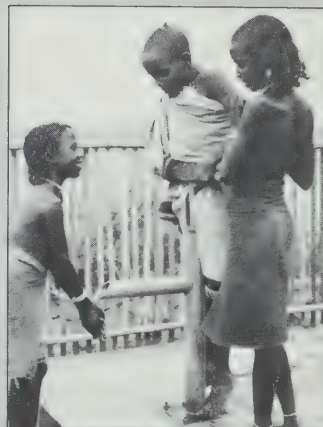
## Correction

The cover photograph of the April issue (Volume 13, number 1) — of weavers in Guatemala — was not credited. The photographer was Lorne Peterson. Also overlooked was Guillermo Perez, who took the photograph of the Mexican street vendor that appeared on page 14 of our January issue (Volume 12, number 4). We regret not recognizing their work with proper credit previously.

## In future issues

Coming in future issues of *Reports*:

- research to develop a low-cost, village operated and maintained water pump
- some success in controlling insect pests with insect predators, and some new challenges
- migrations of people inside and outside their countries looking for work
- goats: the rehabilitation of an environmental villain
- educating refugees
- news flow: against the stream from the North





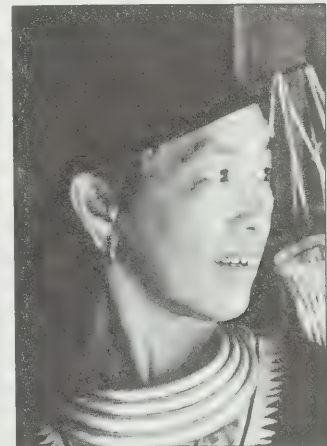
# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Rowan Shirkie. *Associate Editor*: Jacques Dupont. *Spanish edition*: Stella de Felerbaum. *Layout*: Alice Herczuk. *Staff photographers* Neill McKee, Claude Dupuis. *Editorial assistant*: Hope Cadieux-Ledoux

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The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Repub-

lic of Singapore); South Asia (11 Jorbagh, New Delhi 110003, India); Latin America (Apartado Aéreo 53016, Bogota D.E., Colombia); and the Middle East (P.O. Box 14 Orman, 40 El Messaha St., Dokki-Giza, Cairo, Egypt).

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Unsolicited manuscripts and other editorial materials are welcomed and will be considered for publication.

All photos IDRC unless otherwise specified.

**Cover:** *Hmong woman in Northeast Thailand. Development has only just begun to reach women —and not always with good effect. See stories starting page 4.*

Photo: Elwood Pye.

**Back cover:** *Larim women in southern Sudan. The role of women in pastoral societies is poorly understood and undervalued in development. See story page 8.*

Photo: Patti Langton



# DEVELOPMENT AND WOMEN

*Even after a development decade  
dedicated to women,  
much remains to be accomplished*

## WITH PROGRESS FOR SOME

### WOMEN AND DEVELOPMENT IN INDIA

VINA MAZUMDAR

*Street theatre:  
protesting dowry.*  
Photo: Sheba  
Chhachhi/Lifetools

**T**he story of women and development in India really begins with the submission of the Report of the Committee on the Status of Women in India (cswi) to the Indian Government in 1975, the year the UN-declared Decade for women began. The processes examined by the committee began much earlier, though.

Fairly soon in its investigation, the committee recognized that the "anti-discrimination approach" — reflected in the laws and the dependence on education, legal equality, and the franchise as the major instruments for women's development — had failed to bring about a meaningful transformation of women's status. In fact, significant processes of decline in women's status in the economy and society, which had begun much earlier, had continued unchecked during the period after national independence in 1947. Development planning, instead of altering, had actually accelerated these trends.

The evidence of this decline could be read in the demographic statistics:

- The proportion of women in the Indian population had been declining steadily for over a hundred years. The only reasonable explanation for this lay in the widening gap between male and female mortality. While general mortality rates showed improvement for the population as a whole, male-female disparities, virtually unknown before the 1920s, had widened in all age groups.

- The economic participation rate of women had declined since the early years of the 20th century.

- During the same period, the female migration rate had increased stupendously, till it represented 80 percent of the total internal migration. It had been assumed that this female migration was for marriage and associational reasons, but the cswi investigation concluded that a large part of female migration was being caused by economic distress and the declining employment situation of women, particularly in rural areas.

- The substantial progress in education hid the rising



number and proportion of women illiterates, and most new opportunities for employment were accessible only to the small minority (less than 10 percent) of women who had received some education.

Discovery of these facts turned a limited inquiry into the known and visible facts of women's development into a search for explanations of why the development process did not seem to be delivering women from the burdens of poverty and powerlessness.

Why had the equality clauses of the Constitution benefit-



ted only a minority and failed in the case of the majority? Why had policy-makers and social analysts neglected to examine these marked trends in women's economic and health situation? Why had the educational system failed to develop a culture of equality between men and women? Why, in a country which could accept women so readily in positions of high power and dignity (including that of the Prime Minister), was it so difficult for the majority of women to participate in the overall decision-making process, and to influence development decisions in their own favour?

#### FAILURE OF LAW

A growing realization of the failure of planned development to reduce poverty, unemployment, and inequality in the society added emphasis to the need for new strategies that reached poorer, less-privileged women. Development aggravated inequalities that persisted within traditional roles. While elite women were restricted by cultural traditions from engaging in any visible economic activity, women in the peasantry and other working sections of the population had traditionally played major roles in agriculture, industry, and services. Yet, examination of the official "Five Year" plans of the Indian government revealed that this fact had been totally ignored by the planners. Women were seen only as passive targets of education, health, and welfare programs. Programs for agricultural, industrial, or infrastructural development had, by ignoring women's active role in these fields, contributed to their marginalization at an even faster rate.

Statutory laws, while trying to ensure women's equality, were modelled very often on the laws prevalent in highly industrialized societies, where women's participation in economic activity was marginal. The legislated laws sought to reform the coded laws of the major religious communities — Hindus, Muslims, Parsis, Christians, and Jews — and ignored the uncoded customary laws that were often closer to the realities of poor women's lives.

Custom recognized the multiple roles that women had to play as workers, wives and mothers, and individuals. Some of the customary laws gave greater freedom to women than had ever been enjoyed by women of the elite classes. The right of divorce, of remarriage after widowhood, of a share of property — rights traditionally denied to elite women — were generally prevalent amongst the lower castes and tribes by custom. But the dominant influence of elite culture had been eroding these customs for a long period. While statutory laws brought relief to many women of the elite, the machinery of a statutory law had not come within the reach of the large majority of women because of their ignorance, poverty, and powerlessness.

Labour laws for the protection of women's maternal functions modelled

## TWO STEPS FORWARD...

Gandhi's call for women's participation in the independence movement brought them out of their homes for the first time, and the economic pressure and greater social awareness in post-independence India have brought an increased number of them into public life and on to the job market. Compared to less than 1 percent literacy among women in 1901, 25 percent are now literate. And 21 percent of the workforce now consists of women.

Indian women today have made a dramatic entry into domains that have so far been male preserves. There is the obvious example of Prime Minister Indira Gandhi at one end of the scale and bandit queen Phoolan Devi at the other. Now women can be found heading business houses and hospitals, and working as magistrates of labour leaders. Sumati Behn Morarjee heads one of India's leading shipping companies. Padmavati Sivaramkrishna Iyer, one of India's foremost heart surgeons, runs a hospital in New Delhi. Three of India's ambassadors abroad are women. Apart from the traditional domains of fine arts, literature, and social welfare, an increasing number of women are now joining politics, business and, above all, the professions. More than 600 000 teachers, nearly 40 000 medical doctors, 18 000 qualified serving scientists in different disciplines, and a couple of thousand lawyers are women.

However impressive, though, these figures tell only a partial story. Nearly

90 percent of working women are in agriculture, engaging in back-breaking manual labour for a pittance, and even there, women's employment is receding as mechanization of agriculture releases men to replace them. Unemployment among women has been increasing at a higher rate than for men.

The increasing awareness of women's rights and persistence of the male-dominated view of society have led to a fledgling women's liberation movement. Organizations like Saheli and Stri Sangharsh have provided a refuge for women, and feminist magazines like *Manushi* and *The Voice of the Working Women* provide a platform for them. Their aims have been to combat and right the injustices inherent in a feudal society. They have taken up cases of discrimination against women in all walks of life and against cases of violence — from rape to burning of brides for failing to provide adequate dowry. But in doing so they have had to organize strikes and demonstrations and have thus come into conflict with the authorities, sometimes clashing with police.

While the feminists have drawn attention to their cause, tens of thousands of others not associated with the movement are bringing about a change by stretching the accepted norms from within. These women at one level accept traditional values in society and family life but at the other break away from economic dependence and seek careers at par with men.

Geetanjali Singh  
*Far Eastern Economic Review*

*Rural women's camp in Punjab: creating awareness and power.*

Photo: Vina Mazumdar





## ONE STEP BACK...

Her daughter, Raj Yadav says, was 18 years old and married less than a year when she was held by the arms, doused with gasoline and set afire by her husband, or in-laws, or both. The daughter died.

She was killed, Mrs. Yadav charged, because neither she nor her parents could produce the approximately US\$1200 and a television set that had been demanded as an after-the-marriage "dowry."

Such incidents have become known as "dowry deaths," and one surfaces in India every few days. The case of the Yadav's daughter shocked the world when it was reported in the *New York Times*. In India, shock is turning to anger among women's groups as dowry deaths — by some estimates, several hundred a year — continue.

Such crimes are universally condemned in public, and the practice of dowry has long since been outlawed. But no one seems to have found a way to deal with the situation effectively.

But one reason is that witnesses to dowry crimes are difficult to find, according to Suman Krishan Kant, a leading women's activist whose Women's Grievances Front aided in the prosecution of some people accused of dowry killing. According to Mrs. Kant, when witnesses are found, they are frequently intimidated by the husband and his family.

The institution of dowry began in India largely because, under Hindu law, parental property was not allowed to be shared by female children. In compensation, parents would give their daughter a gift at the time of her marriage. In time, bridegrooms and their families made handing over the gift as dowry an institutionalized demand.

Now according to a government report issued in 1981, there has been a "revolution in expectations" among younger Indians who live for "the here and now," who covet a middle-class way of life but whose incomes do not allow them to achieve it. Dowry has become a means of bridging the gap.

Women's rights groups charge, however, that avarice has led some men to marry, collect the wife's dowry, kill her when no more money is forthcoming, and then marry again.

All this has stirred debate at a time when, some feminist leaders believe, progress in women's rights has eroded, even as more women have become educated and financially independent.

on international conventions were operative only in the organized sector of the economy, which accommodated only 6 percent of women workers. The remaining 94 percent were in the informal sector, with no protection against exploitation. Even within the organized sector, the oldest and the largest industries — textiles, jute, and coal mines — displayed marked reductions in the number and proportion of women employees. Trade unions apparently made no objections. Only in the public sector of the economy — the services and enterprises managed by the government — was there any improvement in women's employment, because the Constitution prohibits any discrimination between men and women by the State.

Understandably, the undervaluation of women's economic roles, and their exclusion from economic development policies, received the most attention from both researchers and planners. Various working groups have sought to devise better strategies to halt the economic marginalization of women. They identified five instruments: special working units or "cells" for women's development within the major economic ministries — Agriculture, Industry, Rural Development, and Labour and Employment; earmarking a share within sectoral allocations; grass root organizations of women — not as agencies to deliver services, but to empower women to collectively seek ways of improving their situation and to exert their influence on development decisions; special agencies for women's development in all states to organize credit, training, and other support services; and reservation or affirmative action for women — not in jobs, but in all training activities.

### OFFICIAL INERTIA

Acceptance of these prescriptions has been halting and ambivalent. Cells have been established only in the Union Ministries of Social Welfare, Rural Development, and Labour and Employment. Earmarking of sectoral allocations has not been accepted. The principle of women as a target of economic development programs has been, by and large, accepted by top policymakers. The Sixth Five Year Plan, for the first time, contains a chapter on Women and Development, which admits failures to improve women's participation on various fronts and states that the goal of equality can only be realized through economic independence, education, and family planning. Directives have been issued to state governments that efforts to improve women's economic opportunities should be incorporated within all poverty reduction and employment generation programs, and a one-third quota for women has been introduced in the major training program for rural youth.

The response from implementing agencies, however, has been extremely slow and unimaginative. For the

Government — besieged by problems of slowing growth rate, inflation and rising poverty — the issue of women's employment and development is not yet a priority. The connection between women's development and general economic development is yet to be realized. The only two sectors in which this connection has acquired some meaning are the anti-poverty programs, particularly in rural areas, and population policy.

These social development policies generally lack resources and competent and sensitive personnel. The sensitivity that has now developed in some of the senior levels of the bureaucracy declines steadily as one goes down the complex structure of government machinery. At the local — implementation — level, one meets the maximum lack of understanding and resistance.

The welfarist approach — giving priority to education, health and child-care, rather than empowering women — is politically easier, but the poverty of the women who need these services the most puts them out of reach.

### WOMEN'S MOVEMENTS

How does one assess the new women's movement? What is its source, inspiration or perspective? The answers to these questions are not clear at the moment. The movement, though growing, does not present a unified clear trend in ideology, approach or objectives. The issues of dowry deaths and increasing trends in other crimes of violence against women has undoubtedly provided a strong impetus for the formation of new women's organizations, which are militant in challenging these trends. They have also forced some of the older women's organizations (which had abandoned their earlier militancy and settled down to welfarist activities with grants from the government) to rethink their positions.

During the last four years some of the national women's organizations — old and new — of different political affiliations have joined hands in putting pressure on the government for stricter laws against these crimes, for better enforcement and reforms in the police establishments, and for greater attention to women's needs in the Five Year plans. This joint front has also begun a recurring campaign against dowry as an institution in educational institutions, urban neighbourhoods, and trade unions. As a result the antidowry demonstrations in the large cities have often included a substantial section of men — students and trade unionists. These protests have exerted a noted influence on a section of the judiciary. Some of the more recent judgments, particularly of the Supreme Court against violation of women's rights have been extremely sharp and thought provoking. The press has attributed this to the impact of the women's movement.

While these urban organizations



have focused mainly on the issue of crimes against women, a new trend that has been spreading to different parts of the country is the birth of new organizations of poor women fighting for their economic rights. The involvement of a few dedicated young and highly educated women in their full-time staff, and research on these organizations have contributed greatly

to the women and development debate. Knowledge about poor women's issues, the implications of development policy and laws in agriculture, forestry, industrialization, science and technology and other fields is still weak in most women's organizations. Promoting the growth of such understanding through increasing interaction between researchers and activists

will be a long process. If the process can be extended to the educational system as a whole then development will certainly be accelerated and its effects can radically transform the future for women in India. □

*Vina Mazumdar is Director of the Centre for Women's Development Studies in New Delhi.*

## SERVANTS OF SERVANTS

### WOMEN IN DOMESTIC SERVICE IN LATIN AMERICA

MAGDALENA LEON

**D**omestic labour has been assigned to women as their basic role in life, and as a result, women define themselves chiefly as housewives, mothers, or wives.

Yet the domestic labour carried on by the housewife, for her family and without pay, is not considered in conventional analyses to be work. It is classified as being "inactive" in the statistical compilations of our various societies. This is perhaps the clearest expression of the social undervaluation that is attached to domestic labour.

And when a housewife delegates part of her domestic responsibilities — generally to another woman who is seeking paid work in a house outside her own and working for a family other than her own — domestic labour becomes paid domestic service.

What is fundamental here is that such labour, although paid, inherits the same undervaluation of domestic labour. When performed by poor women for money, domestic labour also carries with it a relationship of servitude, and its social undervaluation becomes even more marked.

The phenomenon of domestic service involves power relationships between women and creates some contradictions in the movement towards women's liberation.

The existence of domestic service has made it possible for middle and upper class women to enter the salaried labour market. However, when women work outside their homes all their responsibilities as housewives do not disappear, producing a double work day. Nonetheless, joining the ranks of paid labour is understood to be an essential step in the process of liberation, although not one which completely achieves it. Yet domestic service defeats the claims that household work should be shared by the other members of the nuclear family,



*Domestics: a "fourth world" of development.*  
Photo: Magdalena Leon

and reinforces traditional roles as domestic labour continues to be assigned to women, whether as domestic servants or as housewives.

In Latin America, migration from the countryside to the cities has been a selective process, involving mostly women. The latest UN and regional organization figures show that from 1960 to 1970, about 3.8 million women migrated from the countryside into the cities.

These women, most of them young, migrate under the pressure of rural poverty. When they reach the cities, they swell the ranks of the informal market, mainly as domestic servants. This phenomenon becomes acute in countries in the region that have undergone a very rapid process of urbanization.

A portion withdraw from the labour market when they start the reproductive cycle, either to set up their own home or to bring up their children. Some return to it at the end of this phase, mostly to add to the pool of term or day labour.

A high proportion of these women are single, and the group of unwed mothers represents a very significant proportion. This fact is age related and also has its roots in the difficulty of a live-in servant in balancing work with marriage or a stable relationship. Of the married women, most have been abandoned by their husbands; abandonment is also common among those who admit to some kind of free union.

The level of education of most of these workers is very low, although those who do attain a higher level of education find it difficult even with its aid to change their work situation.

Working conditions are very unstable.

Labour regulations are very limited, and often unknown and disregarded. There are no limits to the workday, particularly for live-in servants, and wages are below the legal minimum. Part of the wages are paid in kind and the rest in money. The increase in the cost of living and the broad economic responsibilities that these servants have to their children and relatives place them among the poorest of the poor.

Domestic service shows the highest percentage of employed women of any type of labour, to such a point that it has been called the work of the "fourth world." In Chile and Argentina, for example, the figure reaches 21 percent employed women, and increases further if one takes into account only the economically "active" urban female population. Rates of domestic service reach 27 percent among women in the Dominican Republic and 37 percent in Colombia.

The increase is even larger if one considers the share of domestic service in female employment in the service industries such as restaurants, laundries, etc. The percentage in this area is close to or about 50 percent. More significant, perhaps, is that these rates were obtained as early as 1960.

Consequently, it cannot be claimed that the high percentage of women in domestic service results from the recent economic crises experienced in the region, although they have served to perpetuate this state of affairs.

In most of these countries, the process of urbanization in the 1960s and 1970s was the result of a migratory flow from the countryside to the cities, carrying along with it hundreds of young women lacking any specific training to enable them to participate in the urban labour structure. But neither did the process of industrialization generate enough alternative employment to absorb this large supply of labour. Most of the women were absorbed by domestic service.

Is it the case then, that domestic service in Latin America is a transitory and temporary occupation, resulting from urban industrial maladjustment? Will it disappear as the various countries of the region modernize and this labour force finds its way into more productive sectors? That is certainly the hope of domestic servants. However, the reality is that there are no clear signs of development in Latin America is headed in that direction. □

*Magdalena Leon is a Colombian sociologist and author of numerous studies on women's roles in Latin America.*



*The contributions of pastoral women are often overlooked*



Photo: Patti Langton

## **VULNERABLE BREADWINNERS** LARIM WOMEN IN EAST AFRICA

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PATTI LANGTON

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**A**t a passing glance, women in East African pastoral or agropastoral societies are chattels, bought with cattle and set to work for men. Close up, their role is far more complex. Certainly, compared with women in some communities of West Africa, who can take over the market trading and become powerful in their own right, their access to wealth and decision making is indirect and fragile. Discovering it and capitalizing on it are a challenge to policymakers with money to spend on development. If they don't take up the challenge, they risk not only eroding the status of these women but also endangering the livelihood of about 70 percent of the populations of tribes like the Larim, Karamojong, Turkana, and Samburu.

These societies are cattle-centred cultures, with public status, marriage, and wealth revolving around the acquisition of large herds of cattle. Cattle herding is the men's domain. Thus, observers have concluded that cattle are the economic base, that men hold all political power and status, and that women hold a secondary and inferior position in social, economic, and political life.

A year living in a Larim village permitted me to observe something quite different. I found women working together in villages as breadwinners in an economy quite separate from that of herdsmen.

The Larim people live in permanent villages. While the adult able-bodied men take the cattle to watering holes during the dry season, sometimes being away for four to six months a year, the centre of daily life for the Larim women is the village. Northern Larim is divided into clan areas.

Villages, each with about 300 occupants, hug the hill bases. A small patch of bush separates one village from the next. The Larim are polygamous, a man marrying again and again as his herd gets larger and allows him to pay for new wives. Most men in the village are related; sons will bring wives from a different clan to live with them in their natal village.

A woman, on marriage, builds her own hut. She builds a huge table inside to store grain, and a granary outside. She is allotted two fields by the clan head, land that her husband initially helps to clear. After that, she grows sorghum, millet, sesame, groundnuts, and vegetables, tends the growing crops herself, harvests them, and carries the grain to her hut. All produce belongs to her. With it, she must feed her household. She also makes sorghum beer for her friends, and for her husband's mates. Beer drinking is an important component of a man's acquisition of status and influence. A man is dependent on a wife to provide it. A man visits his wives, but he has no hut of his own. In village terms, he is "outside."

From an early age, men are oriented toward cattle and goat herding, and women to village life and agricultural production — although the boundaries overlap at the margins. Women are responsible for the total nutritional requirements for themselves, the children, the old, sick and infirm, as well as warriors and husbands during the wet season, and those who visit during the dry season. Women — the "hidden" 50 percent of the population — are often ignored in economic analyses. They contribute sustenance.



They also have responsibilities in relation to cattle and goats. When a woman marries, she is allocated a cow for milk. She may also acquire cattle when close kin marry — a fact not usually noted by observers of pastoral societies. Women are responsible for supervising calves and kids when they are in the village. Blood and meat from animals are sent to women, although slaughtering and bleeding are men's tasks. Cattle are only slaughtered during feasts, or eaten if they die naturally. Goats may be killed for food, but meat is a supplement rather than a staple in the villages.

A man's household consists of his wives and children, unmarried kin, and widows of close male kin. A woman's household depends on the size of the

harvest. In most years, her view of her household may coincide with that of her husband; it may also include close male and female kin from her own clan. In times of scarcity she breaks ties with all but her own children.

The Larim live in a marginal area. When the rains failed at the end of 1979, there was no agricultural produce for 1980. The women resorted to gathering for their sustenance. In convoy, they walked up to 12 kilometres for palm fruits, spinach leaves. Able-bodied men stayed with the cattle, eating carcasses of animals dying from the drought or caught in the wild, and occasionally sending some back to their wives in the village. Women fed themselves, the children, the old, and the infirm. The women preserved the

new generation, the stability and continuity of the society, while the men guarded the cattle and fought their neighbours for waterholes. Women were a strength and a mainstay in their domain, the village.

This leads to another important sphere— decision-making. In pastoral societies of East and Central Africa, age systems and the distribution of wealth in cattle contribute to the establishment of gerontocracy. Young men and poor older men as well as women do not have a voice in public decision-making. For young men, there are alternative arenas for developing influence, in age groups, with their peer groups in hunting, warfare, and friendships. Women, on the other hand, have had to establish nonpublic, more subtle forms of influencing decision-making.

Within the village, women help one another in all their tasks — hut-building, weeding and planting, water carrying, childbearing and rearing. This cooperation gives them solidarity and dignity and therefore, power in the village decision-making. Men may beat their wives and force daughters to marry unwanted old rich men. Yet the Larim women, like most women in Africa, demonstrate great spirit and physical and mental strength. They are not cowed, and they are heard. The women use group pressure on husbands and fathers. Failing that, they can ridicule, refuse to cook, or especially, refuse to prepare the beer and refuse sexual services. They can also use influential male relatives, or make public accusations. As they get older, women acquire status for being good wives and mothers and advisers. In all these ways, women can influence family decisions, decisions about cattle, marriage decisions, village decisions. The nature of the power and influence is subtle, however, and fragile in the face of economic change. It should not be underestimated, nevertheless.

Aid and development dollars change the internal dynamics of the socioeconomic organization of societies. Planners need to be as informed and sensitive as possible to the internal social, economic, and political interactions of the community, to the possible realignment of power, wealth, and dependencies of members of households as a result of interventions. Whether the interventions are to introduce new techniques in agriculture, cash crops, animal husbandry, primary health care, or education, the effects can be devastating. Men, seen as the heads of the households with responsibilities as "breadwinners" — a Western concept — are accorded the cash crops, the new breed cattle, the aid. Too often, misconceptions on the part of planners about the contributions of women within the economy deplete their status and wealth — a double-barreled impoverishment. □

*Patti Langton is a social anthropologist whose work has focused on the southern Sudan.*



*Not just abstract economic units, but people.* Photo: Patti Langton

## NOT A SEPARATE REALITY

"There is a need to develop a well-rounded view of pastoral society and to ensure that the study of social change is a study of people — men, women, and children — and not just abstract units, such as households," social anthropologists Patti Langton, Vigdis Broch-Due, and Elsie Garfield say in a report presented to an IDRC-sponsored conference on the future of pastoral peoples.\*

Economic development — in particular changes from one production system to another — often leads to a situation where women lose power and status, the authors say. Woman find that their traditional fields of control do not have the same significance in the new context. For instance, case studies have shown that the transition from subsistence agriculture to the production of cash crops for an external market has adversely affected women's position. Men accrued the benefits of cash-crop production, whereas women's work burden increased and they became marginal producers in the increasingly important market economy. Such studies

have led scholars to generalize that economic development per se has adversely affected women; another possible interpretation is that development policy is the underlying problem because it concentrates on men as cash earners and decision makers and fails to view women as participants.

The report notes some encouraging results from recent studies in pastoral settings in Kenya — involving the Somali, Maasai, and Turkana. These seem to show that socioeconomic change has led to greater economic opportunities and control over resources and decision making for pastoral women. However, Langton and her colleagues believe it is too simple to conclude that pastoral women will gain more by development than agricultural women. Any generalizations that ignore the great diversity of social-cultural systems, environmental conditions, and the nature of new economic possibilities and how they are introduced or evolve are equally unsatisfactory.

*\*Published as IDRC-175e, The future of pastoral peoples.*





## CHICKEN FEED BUT WORTH DEVELOPING

*Gains at low cost.*

FIBI MUNENE

**N**ot long ago in Mbooni, Kenya, village women decided to start rearing chickens to earn extra cash. Hybrid chicks were brought from abroad by donor agencies.

Eight months after the project was started, it was clear that the women were losing money.

Traditionally, chickens are left to "feed for themselves" and depend on insects, by-products, and food wastes for their food. The resulting production of meat and eggs is low.

But when the women purchased the nutrient-rich feed from commercial firms, as they had been advised to do to raise productivity, they found the price so high they could only afford to give a small ration each day to the chicks. Consequently, their growth and egg production suffered.

The problems of the women in Mbooni are typical of rural women in Kenya, for whom raising chickens has become a popular way to supplement incomes. Kenya needs high-quality protein for its population, which is expanding at 4 percent a year — the highest rate in Africa. Poor husbandry and high-priced feed, however, keep the production of poultry — potentially an inexpensive way of filling this protein gap — at meagre levels.

The average smallholder rears between 5 and 25 chicks a year. Each has a matured body weight of about 1.6 kilograms and lays about 65 eggs a year. This low productivity results in low consumption of chicken eggs and meat. According to the Kenyan Ministry of Livestock, annual consumption of eggs per person in the rural areas is only 16; average chicken meat consumption is 1.5 kg.

The Kenyan government has recognized the importance of poultry farming in improving the diet of the rural population — now mainly pulses, root crops and cereals — and in providing

profits for the farmers. In 1976 the government launched the National Poultry Development Program (NPDP) to develop commercial and small-scale poultry farming.

The NPDP has set up pilot projects all over the country for promoting new technologies in poultry farming. Farmers are given loans to purchase new stocks of chickens, and all aspects of production and marketing of eggs and meat are supervised by NPDP's extension officers.

The NPDP has given broiler production in small-scale farms a low priority, because the farmers cannot afford the commercial feeds. The project's greatest success so far has been the improvement of the local birds through a cockerel exchange program. The improved roosters require compounded feeds for only a few weeks, after which they are released for free foraging. Through this project, in some rural areas the consumption of poultry meat has increased by 115 percent and of eggs by 55 percent. Also, in some cases, the number of people turning to poultry raising has increased by up to 80 percent.

Despite these successes, progress is threatened by the lack of suitable feeds at reasonable prices, as in the case of the Mbooni women's project. Since the cost of feed constitutes over 70 percent of the expense of raising poultry, broiler meat is comparatively more expensive than beef or mutton.

The feed companies in Kenya mostly serve commercial farms near the cities, where a high demand from the tourist trade for poultry products make the production economics better. Little of the 40 000 tonnes of commercial feed produced each year reaches the rural areas. Transportation problems, delivery costs, and the already high price of the feeds put them out of the reach of rural producers.

Inadequate local supplies of protein is one of the prime reasons for the high cost of compounded feeds. Although meat and bone meal are produced locally, feed components such as fish meal, soybean meal, cottonseed and groundnut cakes, vitamins, and trace minerals used in the commercial feeds are all imported.

A project at the University of Nairobi, supported by IDRC, has been looking for alternative feeds to meet the needs of the small poultry farmer. Besides identifying alternative energy feed sources, such as millet, sorghum, and root crops, the researchers have looked to nonconventional sources such as pigeon peas, leaf meals, and agricultural by-products for protein supplements. Maize is the principal energy supplier in poultry feeds, but almost all production is used for human consumption. This human requirement is unlikely to decrease, making maize very scarce for poultry feed.

Dr Modestus Gomez, a senior lecturer in the Department of Animal Production at the University of Nairobi, presented the findings of the project on alternative feeds to a recent workshop in Nairobi. He reported that bulrush millet appeared to be a good replacement for maize due to its higher protein contribution, and that it could be improved further with lysine supplementation.

Raw pigeon peas were a suitable source of protein at levels up to 15 percent in chickenfeed rations, he said, and were improved by some processing and the addition of two amino acids. Bulrush millet and pigeon peas combined were able to replace up to 40 percent of the conventional energy and protein sources in poultry feedstuffs.

Producers of commercial chicken feeds say that millet and sorghum are not readily available in economic quantities, and do not include them in their feeds. And although bulrush millet is well suited to the hot, dry lowlands in Kenya with their poor sandy soils, it is not widely cultivated because of its extreme vulnerability to bird damage. The pests know a good feed when they find it. Sorghum production, on the other hand, suffers from a lack of well-organized markets or a strong commercial demand.

Some economists say that because of the importance of pigeon pea as a human food and cash crop in the dry areas of Kenya, it is unlikely to be available for poultry feeds in the near future.

Still, both pigeon peas and bulrush millet can be homegrown and substituted successfully for maize in poultry feeds. What is needed now, according to one woman from Mbooni, is "some way of processing here at the village level so we can use these feedstuffs in our own farm-mixed feeds." Perhaps then, the economics of chickenfeed will prove their real worth. □



# THE HORMONAL RING

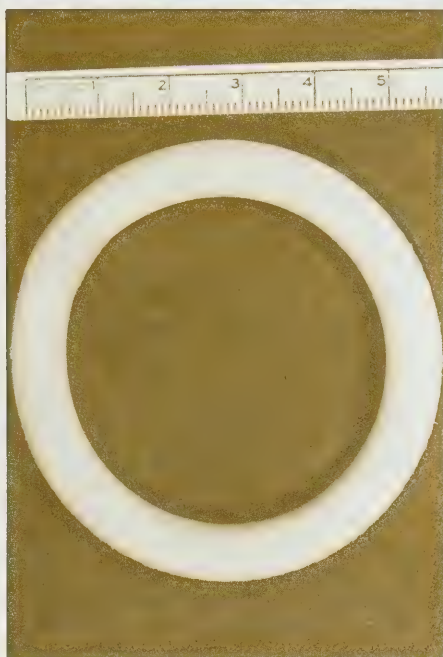
## A NEW CONTRACEPTIVE GAINS ACCEPTANCE

ELLEN E. HARDY, QUINTINA REYES, FERNANDO GOMEZ, RAMON PORTES-CARRASCO, and ANIBAL FAUNDES

In many developing countries, meeting the demand for family planning services will depend on the development of contraceptive methods that are effective, acceptable, and can safely be delivered at a low cost by paramedical personnel without direct medical supervision. Encouraging results have been obtained in programs where contraceptive pills have been distributed by community leaders, vendors, or midwives without a physician's prescription or intervention, but the safety of such programs is being questioned as more evidence of the pill's side effects come to light.

The Population Council's International Committee on Contraceptive Research (ICCR) — a committee of nine scientists, four of whom are developing country nationals — has been working on an alternative hormonal contraceptive in the form of a vaginal contraceptive ring. The ring is 58 mm in diameter and consists of a core of Silastic®<sup>2</sup> — a silicone rubber material that has been used for years in artificial vessels, prosthesis, etc. — covered by a thin layer of levonorgestrel (one of the steroids most commonly used in contraceptive pills) and estradiol (a hormone that prevents intermenstrual bleeding) and an overcoat of silicone rubber.

The ring is inserted into the vagina on the fifth day of the menstrual cycle, and withdrawn three weeks later for one week. The contraceptive steroids are released from the Silastic at a regular rate and readily absorbed through the vagina. Thus, the blood levels of contraceptive hormones reached during the use of the ring are sufficient to prevent ovulation but do not exhibit the great daily variations commonly observed in women on oral contraceptives. There are sufficient hormones in the ring to provide six months of contraception.



Preliminary research on Swedish and other developed country women indicates that the ring is as effective as, and safer than, the pill. Still, it was not known whether a method that involved handling the genitals twice a month and carrying a foreign body in the vagina for three weeks a month would prove acceptable to the poorer peri-urban and rural women in developing countries who were expected to benefit most from safe, reliable contraception.

In order to find out, IDRC agreed to support a study of the ring's acceptability in actual practice, carried out by the National Council on Population and the Family, Santo Domingo, Dominican Republic, and the Centre for Research on Maternal and Child Health, Campinas, Brazil. The ring was offered, along with other methods, in a number of clinics in each country where prescriptions, instruction, and follow-up were the responsibility of paramedical personnel. The study involved an observation period during which 150–200 ring acceptors in each country were to be enrolled and matched with pill users. A survey of the users, covering their demographic characteristics and satisfaction or dissatisfaction with the method, gathered information. Pill users were chosen for comparative purposes because both methods are hormonal, both require the same sequence of use and rest, and both tend to induce regular menses.

The survey findings indicated that ring users were slightly older than pill acceptors and that they and their partners tended to have more education. With regard to the method itself, 10 percent of ring users complained of difficulty associated with insertion, 20 percent of difficulty with removal. Forty-three percent worried about correct placement. Considering that women were told that the ring would

work however inserted in the vagina, this percentage is remarkably high. Thirty-three percent reported that the ring had caused vaginal pain and 10 percent reported having expelled it at some time or another. About half the women in each country said that the ring had changed colour during use and about a third of those who noted the change did not like it.

Ring users and pill users were asked whether they had experienced any problems while using the method. Twice as many ring users reported menstrual problems, but a significantly larger percentage of pill users (26 percent) as compared with ring users (17 percent) reported having other problems, such as headaches. Forty-two percent of ring users, compared with 62 percent of pill users, said they gained weight. Almost all (90 percent) of the Dominican women liked the weight increase, but 53 percent of the Brazilian women did not — probably a cultural difference explained by the fact that thin is associated with beauty in Brazil, while a full figure is considered a sign of good health and looks in the Dominican Republic.

As far as satisfaction with the method was concerned, a significantly larger percentage of the ring users (17 percent) than pill users (7 percent) considered their experience "very good," but the general level of satisfaction with both methods was similar.

An earlier study indicated that women liked the fact they had control over the use of the method, that they could insert and remove the ring at will, and that it was possible to remove it to have intercourse or wash it for hygienic purposes. Another positive finding that emerged from this study was that a decrease in the amount and duration of menstrual bleeding was welcomed by most users — as was the increase in body weight, at least by the Dominican women. Although these findings may be culturally related rather than universal, it is nonetheless encouraging to observe that in societies where malnutrition and anemia are not uncommon, contraceptive side effects that work against these problems are well accepted by the female population.

In addition, the information obtained from the study provides important data for the final design of the new method and the instructions that will accompany it. The concerns of the women regarding insertion, removal, and placement of the ring suggest that it may be worthwhile trying a narrower and more flexible model. In any case, detailed instructions, clearly stating that any place within the vagina is appropriate for the ring to be effective, should accompany the final model. Also, considering that a number of users were disturbed when the ring changed colour with use, correction of this factor might improve the ring's acceptability. □

*The authors were members of the project team in Brazil and the Dominican Republic testing the contraceptive vaginal ring.*





Tigitch, Morocco: transformation by train.

# A RUMOUR OF TRAINS

## THE RAILWAY AND ITS IMPACT IN A REMOTE REGION OF MOROCCO

ANDRÉ McNICOLL

**T**he introduction of new transportation routes in the remote areas of a developing country is often accompanied by major economic, social, cultural, and ecological upheavals. In the Ounein cirque, an isolated mountain basin district in the Moroccan High Atlas between Marrakech and Agadir, a new railway will penetrate the cirque, cutting through the heart of the valley. How will this affect the approximately 5700 Berbers, scattered in some fifty tiny villages and hamlets, who live there? The Institut agronomique et vétérinaire Hassan II in Rabat, supported by IDRC, seeks to find out.

Night has fallen. In a simple stone house in the hamlet of Tigitch, Omar Ayt Ballali closely examines his receipts under the warm light of a candle. Sales in his grocery in the Adouf market in Ounein have been good today. Several families came in for their provisions: almonds, onions, sugar, salt, vegetable oil, and soap. Yet Omar is nevertheless uneasy. Soon to

turn 30 years old, he is married, has two children, and wants a promising, stable future.

A single, precarious path, climbing from 1000 to 2120 metres in altitude links the Ounein cirque with the outside world. But this tenuous link disappears after every rainfall, and during the four to five long months of winter. Omar and his father Abdellah can remember when, not very long ago, a pregnant woman in some distress had to be taken on the back of a mule and then in a cart for 60 kilometres to receive treatment. People have had enough of this type of isolation.

The inhabitants of the Ounein are eagerly awaiting a great event that will free them from this uncertain, winding path: the arrival of the train! His Majesty King Hassan II has announced the construction of a railway linking Marrakech with the Western Sahara. Undertaken by the Office national des chemins de fer (Moroccan railways), the railway will probably be operating by 1988. But what impact will the train have on



these people, on their customs and way of life?

Similar experiences in North America are hardly reassuring. The railways built across the Great Plains of the United States and Canada in the 19th century caused grave upheavals amongst the native peoples. The Comanche, the Apache, the Omaha, the Sioux and several other tribes were devastated by the construction of the railways and by the alcoholism, disease, and violence that came down the line. All that is left today are a handful of reserves where the survivors struggle to preserve a few fragments of the past, and to avoid sinking into nostalgia and bitterness. In America the coming of the train was a brutal event.

The Berbers of the Ounein, however, do not believe the same fate awaits them. "The people are very, very happy that the train is coming," the elderly Abdellah explained. But what is the train going to change? "The people aren't worried about that," he added. "We see the benefits: communication, supplies, construction materials... prospecting for minerals has already started to pick up again. It will be easier to sell our agricultural products."

"I'd like to buy some purebred dairy cows, but at the moment — since there's no way of moving it — I can't do a thing with the milk," declared Omar, the son. Even more than his father, he wants the train as soon as possible.

It might seem a bit strange that a people as traditional as the Berbers, who have lived in one of the most remote areas of the Maghreb for at least two centuries, are so eagerly attracted to modern life. Yet the railway and all that it might involve do not seem to worry anyone.

"The Berber society is not as closed as one might think," explains Professor Farouk Alioua, an economist at the Institut agronomique and member of a team of specialists currently combining their efforts in the Ounein valley. "Emigrant workers in Europe and elsewhere have sent back not just money but also new ideas. There are commercial exchanges as well as bartering. It's not on a large scale, but it does exist."

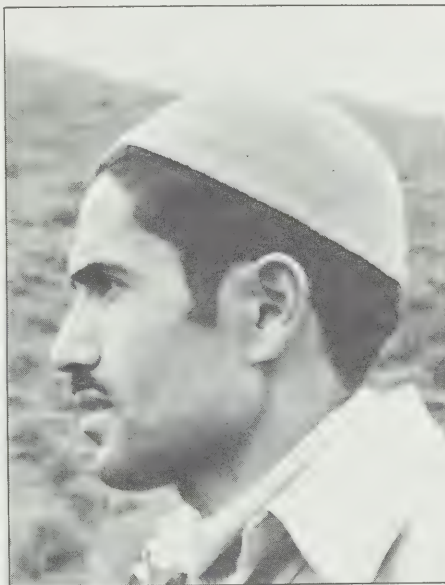
#### A NATURAL LABORATORY

For Professor Paul Pascon, head of the Ounein project and director of rural development at the Institute, the Ounein is a "natural laboratory." "It's a small basin, contained and easy to study. The construction of the railway will be a major event, spectacular, affecting all aspects of life there. Experimentation is not possible in sociology, in the humanities; predictions in these disciplines are too often more a matter of art than of science."

The purpose of the Ounein project is to anticipate a wide range of socio-economic and ecological effects of this event by carrying out a study covering three specific periods of time: before the work begins, during the construction, and five years after

the opening of the rail line. Attempts will be made to measure the changes in social relationships, agriculture, and commerce.

Paul Pascon is head of an impressive multidisciplinary team that includes sociologists, economists, and experts in agriculture, forestry, and several other disciplines. The team will enter into as much descriptive detail as possible in their research in order to arrive at a rigorously scientific global view. The team will develop a conceptual framework and a methodology to study the changes that will take place in the Ounein mountain valley. More important, possibly, will be the preparation of recommendations for the administrative authorities aimed at reducing the foreseeable harmful effects of the railway. And perhaps yet more important, will be the preparation of recommendations for those same authorities aimed at reducing the possible harmful effects. There are 800 rural communes in Morocco alone the size of the Ounein.



Omar Ayt Ballali: eager for change.

The soil, the climate and the natural vegetation of the region will be studied. The villages and hamlets of the Ounein are very clearly distributed on the sides of the cirque, along a series of springs. The water is used for mountain gardening.

The purpose of the study of mineral, horticultural, and pastoral production will be to identify the factors required for an understanding of the economic system of the valley. The heart of the valley is covered with natural grazing land for goats and sheep, and there are a few small mining operations that provide barytine, and copper with a small silver content. There are almond, hazel, and fig trees, and in the gardens carrots, lettuce, turnips, and onions are grown — although not in sufficient quantities to be marketed. The mere rumour of the railway has made people aware of the commercial possibilities of their products and resources. There are already a number of exports from

the region: artemisia, an aromatic plant, to the large markets of Tetouan and Marrakech, carob to Agadir and Marrakech, and thyme and lavender throughout the world.

A third study will evaluate the economic situation of the valley: the value of goods produced; the economic effects of emigration (the population of the Ounein is characterized by heavy emigration to the large cities of Morocco and Europe); an examination of exchange patterns; a study of the standards of living by social category; and, lastly, an estimation of the circulation of funds.

After a direct study of the population, the age distribution, and the natural population growth, an analysis will be made of emigration by type of activity, sex, age, and so on. Lastly, food and other consumption will be studied in relation to the size of the population.

In regard to the study of social changes, an effort will be made to describe the current structures and to identify the developments that have taken place over the last 70 years.

As for the study of the technical aspect of the advent of the train, the team does not intend to cover the same ground as the railway company's project, approved by the Moroccan government. It plans to study the problems of land ownership; the problem of local labour; the permanent institutions resulting from the construction of the line; as well as the work required for electrification, connecting lines of communication, water supplies, and so on.

#### A RARE OPPORTUNITY

This event offers a rare opportunity to specialists in the humanities and those interested in the scientific rigour of their disciplines. As Professor Pascon explained, "It had to be a small region so that a large number of specialists could combine their efforts with some assurance that nothing of importance would be missed. A major event, such as the extension of the railway, prepared in advance, was also a prerequisite to forming a basis for their analyses." The study is also a rare opportunity for the Berbers of the Ounein whose customs, traditions, habits, and values are much less likely to be disturbed than was the case for the American Indian.

Daytime again. Omar and his father have come back to the house to eat. They have been working in the hills since four in the morning. The coffee is strong and black with lots of sugar, and the barley bread is followed by a bowl of boiled maize with milk. They are talking about the train, about the benefits that it will bring. They stop and quietly turn toward the horizon... expectantly listening for the distant sound of trains. □

André McNicoll is senior writer in the Communications Division of IDRC.



# LIFE AFTER OIL

## A POST-PETROLEUM ECONOMY FOR TUNISIA

AN INTERVIEW WITH ECONOMIST ANDRÉ RAYNAULD

**A**ndré Raynauld is a former president of the Economic Council of Canada and a key figure among Canadian economists. Through his participation in a large number of cooperative projects with Third World countries, he has acquired a thorough knowledge of the economies of several African nations, including Tunisia. For two years he has participated in a cooperative project involving the Institut d'économie quantitative de la Tunisie (IEQ) (quantitative economics institute) and the Centre de recherche en développement économique (CRDE) (economic development research centre) of the University of Montreal, where he teaches. Reports associate editor Jacques Dupont met Mr. Raynauld to examine with him the characteristics of the Tunisian economy: its background, and the challenges and problems that are facing this Maghrebian country.

**Reports:** How is the economy of Tunisia viewed, generally?

**Raynauld:** Tunisia is a small country in the Maghreb Mediterranean with only seven million inhabitants. It had the good fortune to acquire its independence earlier than its neighbours, in 1956, and perhaps at less cost. Its political leadership is remarkable: the political leaders are moderates, and Tunisians are peace-loving people. Tunisia is devoid of major tensions and deep divisions concerning political and economic development policy. In fact, it is a country with relatively liberal political institutions. For example, the government has just recognized a number of opposition parties.

These characteristics have certainly contributed to the prosperity that Tunisia has enjoyed for the last 15 years or so. The GNP (gross national product) grew by 7 percent a year in real terms during the 1970s. A rapid growth rate, very rapid.

**Reports:** Was this because of oil revenue?

**Raynauld:** Partly. Large deposits of oil were discovered and during the second half of the 1970s. In par-

ticular, these discoveries made it possible to almost balance foreign trade. So, oil helped to bring a certain equilibrium to the Tunisian economy. But on the other hand, since the country did not have unlimited reserves at its disposal it could not make a radical change of course and head into the type of overambitious projects in which Brazil and Mexico became involved.

**Reports:** Does Tunisia have other potential sources of income?

**Raynauld:** Of course... other minerals and phosphates, olive plantations. Unlike other countries, which have only one string to their export bow — making them vulnerable to the fluctuating prices of a single item — Tunisia can rely on a diversity of products. And you have to remember its relatively advanced state of industrialization. It is a country in transition, moving steadily toward the advantages and disadvantages of a modern country... although its industrial base is rather rudimentary because it is recent and uneven. It is clear that Tunisia is no longer a developing country, even if it cannot be classified as a developed one. It belongs among the newly indus-

trialized countries — with the Ivory Coast, Morocco, and others. The government is deeply concerned that this new wealth should not create flagrant or intolerable inequality.

**Reports:** So, how is the government going about distributing the wealth?

**Raynauld:** There is an income tax system, which functions fairly well. We must remember that in Tunisia, as in many similar countries, about half the labour force is made up of independent workers. This means that income tax collection is only relatively effective. Taxes permit the collective wealth to be redistributed to some extent. The government has also laid great stress on education and health care. There are relief services to meet the needs of the poverty-stricken and the starving. All these measures ensure a certain redistribution of wealth. Moreover, the state plays a very considerable role in this mixed or social-democratic economy. Increases in salaries and the prices of many foodstuffs and basic products are controlled.

On the other hand, it was never intended that involvement in the production sector would be restricted to the State. Consequently, people have been left free to establish businesses, and efforts by the private sector have even been actively encouraged. With time, however, all regulatory systems become increasingly ineffective, and action in Tunisia has already been taken to make them more flexible.

**Reports:** Could you enlarge on that?

**Raynauld:** Well, when you have controls on an economy, the economic agents naturally try to escape them. As the economy develops and becomes more complex, the controls become easier to circumvent and elude. It is much more difficult in this kind of modern context to anticipate what dealings may take place. From this point on, it becomes necessary to relax the controls or review them regularly and note their undesirable effects.

Take bread. The price of bread in Tunisia has remained about the same for ten years. The government is in effect penalizing the producers, who have to absorb the increased production costs. Agriculture is faced with a continual decline of its revenue. To compensate, therefore, the producers of bread are subsidized, as are all other sectors where the government wants to curb price increases. These subsidies become larger and larger as time goes by. The population is increasing, the standards of living is increasing, and so is consumption. In the final analysis, all these subsidies eventually threaten the government's financial stability.

This is why we were asked to help the IEQ, which wanted to develop an



Orange grower in Tunisia: more than one string in the export bow.



overall economic strategy dealing on a priority basis with this question of the compensation fund. The solution suggested was to allow the prices for a number of subsidized products to gradually rise to the level of the real costs, and to exclude some of them from any form of control. The liberalization of prices is done very slowly, however, because of the enormous public resistance to price increases, as the recent riots demonstrated so tragically.

The investment laws have also been modified to make them less stringent for foreigners, in order to attract new capital. Tunisia continues to exert tight control over transactions with foreign countries, but more openness is evident in this regard. They want to move away from protectionism in the interest of greater wealth.

**Reports:** Can you compare the Tunisia experience with that of Mexico? You mentioned that Tunisia was fortunate to have only limited oil reserves...

**Raynauld:** Simplifying the Mexican experience a great deal, I would say this: they discovered large oil deposits and immediately concluded that with reserves on that scale, they could undertake any project they wanted.

During the 1970s, when the price of oil had increased very significantly, financial institutions loaned fabulous sums of money on the basis of oil guarantees. They did not foresee that the price of oil would stop increasing, still less that it would decline, any more than they foresaw the kind of recession the world had been going through. The result is that countries like Mexico invested much too heavily and went too far into debt.

Fortunately, Tunisia did not have sufficient oil reserves to support such wild dreams... and this is what saved it. Tunisia was reasonable in its investment plans because it did not have this virtually limitless credit margin. Tunisia's foreign debt is about average for a developing country, and the cost of this debt does not exceed 20 percent of its exports. Its situation with respect to foreign financing is much better than that of Morocco, for example, which is much deeper in debt.

**Reports:** How do you see Tunisia's economic future?

**Raynauld:** The challenges facing Tunisia are related to its stage of development. A keen impatience for a higher standard of living can be felt among the people. This tension manifests itself during major national salary negotiations. The guaranteed minimum industrial wage and the minimum agricultural wage increase by 15-20 percent a year. These basic wages obviously influence the entire wage structure. In 1983, the average wage increased 20 percent, which means that with a 5 percent



*André Raynauld: a daring frankness in Tunisian policy.*

productivity rate, there is obviously inflationary pressure.

**Reports:** Is there a very dangerous inflationary rise?

**Raynauld:** Not yet. They have had an inflation rate of over 10 percent for two years, which is not all that alarming. The danger is real, however, because the government allows businesses to increase prices to keep up with the increases in wages and production costs. Thus, if wages force costs up too rapidly, there will be a danger of very high inflation.

**Reports:** What is the impact of minimum wage legislation in the industrial and agricultural sectors, if, as you say, half the labour force works in the parallel sector?

**Raynauld:** These wages apply to the modern sector of the economy, private as well as public — to all firms included in the government's economic plan, all government agencies, all tax-paying firms, and so on. With half of the economy affected, can the other half remain completely untouched by these increases? There is no clear answer.

**Reports:** In the government's view, which are the priority sectors of the economy for development?

**Raynauld:** Aside from the resource sector — oil, phosphates, and food products — there is the processing sector, which is in its infancy. In the next plan, the government is going to emphasize the development of increased capacity, especially in the mechanical and electrical industries. With the help of the World Bank, the government intends to redirect industry toward products with more rapid growth. This should constitute a marked improvement in the economic infrastructure.

**Reports:** Who is going to develop these sectors, the government?

**Raynauld:** What distinguishes the plan is the fact that the funds earmarked for investment purposes exceed by 100 percent the amounts assigned to actual projects. The government is saying, "We are requesting contractors in the sectors specified to submit proposals; these

will be well received and encouraged if they are deemed viable." The government wants to support the private sector by maintaining room to manoeuvre with respect to investments. This new method seems to me to be more dynamic, although it makes the task of the economic planners more difficult in the medium term.

**Reports:** Do we have a good idea of the present unemployment rate in Tunisia?

**Raynauld:** Not really. The figures are not very reliable. In Tunisia they speak rather in terms of jobs to be created for a given period and of the increased number of workers available. I am always impressed by the frankness of the Tunisians. A good example of this frankness is seen in the plan, where it states openly — even brutally — that "from 30 000 to 40 000 Tunisians will have to leave their country to seek work elsewhere." Every year this number of people will have to leave — most of them going to the Gulf countries — in order to find work; there are official agreements with Saudi Arabia, the United Arab Emirates, and Kuwait. We, in Canada, are dumbfounded by such frankness. There is not one Canadian politician who would dare admit to the existence of such an emigration policy. Here, these are called "employment mobility programs," casting a discreet veil over what they may involve. In Tunisia, however, they say bluntly what is going on.

**Reports:** Would you tell us about the cooperation project between the Canadian institution and the Tunisian one?

**Raynauld:** One of the interesting characteristics of this program is that — as with all IDRC programs — it is the researchers of the Third World institution who define the research priorities. The Tunisian Institut d'économie quantitative (IEQ), which is responsible for all the studies, establishes their content and orientation. The IEQ suggested a number of research topics and we at the University of Montreal's economic development research centre (CRDE) act solely as resource persons. We have no formal responsibility in the studies. We go to Tunisia on request, for example, when the researchers ask us for specific advice on some study or other, for a more complete bibliography, or when a technological contribution is required.

I believe that this kind of project constitutes the future path of co-operation between developed and developing countries. The participation of foreign experts enables Third World research communities, whose human resources — although trained — are neither sufficiently experienced nor sufficiently numerous, to carry out their research projects and bring them to a successful conclusion.





(left) A child found wandering the street at night is picked up by San José metropolitan police. The Patronato Nacional de la Infancia (PANI), an organization dealing with abandoned children in Costa Rica, will try to find members of the child's family. If none can be found, the child is considered abandoned, and placed in a private or public institution.

Photo: Maria Elene Esquivel/Tico Times.

(Above and opposite page) Children placed by the PANI welfare organization in Pueblito, an adoptive family and community organization. The children will live in Pueblito until they are 18, under the guidance of their adoptive parents. Parents and children work in small farming enterprises to support themselves.

Photos: Pueblito.

# LOST AND FOUND

## ABANDONED CHILDREN IN COSTA RICA

DENIS MARCHETERRE

**T**he children of the streets are beings as complex and unpredictable as the environment in which they find themselves. Left to their own devices, they will ply any trade: hawker, lookout, singer, beggar or burglar, usually under the indifferent gaze of passersby. The street urchins are usually responsive and grateful to those who help, rude and aggressive to the indifferent. In the street, freedom of any kind often seems better than any alternative that might present itself.

At the beginning of this decade, the United Nations Statistical Office estimated that there were five million children living in the streets in Latin America. In the case of Costa Rica, 1983 figures reveal 8000 children in institutions and 20 000 living in the streets — 28 000 of a population of 2.5 million. More than 40 percent of the country's population is less than fif-

teen years old. A large portion of these young work without the protection of laws or other control measures to protect rights or guarantee healthy living conditions. So it is a precarious life for 20 000 of the children that the Costa Rican state considers as abandoned.

The phenomenon of the abandoned child in Costa Rica is linked to the social and economic characteristics of the society. Studies attribute most social changes in Costa Rica during the past three decades to the country's exceedingly rapid industrialization, a process in which the perception of the role of the child and the family within Costa Rica has changed for the worse.

In the migrations of the 1950s and 1960s that saw masses of rural people flow to the capital, San José, the poor were shunted aside — marginalized. A parallel social system was created, composed of those unable to adapt to

the fast-paced urban changes. This marginalized population had to evolve its own value system and "laws": one of the consequences was the growing number of abandoned children.

Even though the proportion of children living in the streets is much larger in cities, the phenomenon is not a strictly urban one. Abandoned children are also found in the most isolated areas of the country. Poverty is not the only cause for abandonment. In the country as in the city, the relaxation of mores, the proliferation of unwed mothers, prostitutes, homeless women and women beggars, parental ignorance of their obligations and role, family conflicts, the incidence of mental deficiencies in some adults, the lack of proper contraceptive methods, and the recent phenomenon of family break-ups are all factors contributing to an increase in abandoned children in Costa Rica.

These children are undernourished, shy despite their apparent aggressiveness, insecure, unstable, and rebellious. The harshness of street life has also led to physical and mental handicaps. In addition, they are often dangerously habituated, as early as from the ages of six to twelve, to alcohol, drugs, and a rootless way of life.

A child is considered abandoned,





according to criteria set down by the government of Costa Rica, not only when there is no family but also when while in the family, the child is physically or mentally mistreated by parents, or if there is not "adequate" guidance. In such cases, the state reserves the right to assume responsibility for the child, including removing the child from the family and placing him or her in the care of an institution.

For the International Year of the Child in 1979, Costa Rica gave priority to policies and programs aimed at improving the well-being of its young people. The principles of the Declaration of the Rights of the Child were updated to mark the occasion, organizations and programs were evaluated and reformulated, and some projects undertaken.

Through the Patronato Nacional de la Infancia, or PANI, an organization specializing in so-called abandoned children, Costa Rica today is endeavouring to provide the food, shelter, affection, and support these children need.

Three government-funded group homes in different areas of the country support the sincere efforts of the government to assist disadvantaged children — although, in accordance

with its philosophy and objectives, PANI attaches the greatest importance to adoption and placement activities. The centres are never intended to replace a real family environment, as PANI representatives quickly point out.

PANI's multidisciplinary mode and its recent moves to decentralize and operate in the regions have increased its importance and influence in the eyes of the government, the legal system, and the people in general. Yet despite its apparent efficiency, PANI's efforts are often impeded and plagued by a heavy internal bureaucracy, and the duplication of work and the lack of planning and coordination between PANI and other public organizations intervening with young people.

In an approach to strengthen family bonds to prevent abandonment the hospital network also participates in the search for solutions. One hospital in the capital set up a mother and newborn live-in program a few years ago, specially designed for unwed mothers, prostitutes and teenagers. A 1983 study showed an encouraging decrease in the percentage of abandoned infants in some of the poorer quarters of San José where live-in programs were offered. An additional benefit has been the drop in the prevalence of disease at birth.

Some 22 private institutions are also working to improve the well-being of the street children. One example is Pueblito, a Canadian non-governmental organization project administered by Costa Ricans. The institution provides 80 children with the support and education they need, using an approach that is unique in Costa Rica: instead of placing young people in the community setting of a group home, it gives them a family life with adoptive parents in a house on the grounds of the institution.

The importance of their role notwithstanding, institutions and group homes are still a temporary solution, as they can only bind the wound, not eliminate the social wounding that produces abandoned children. Meanwhile, the children, with all their contradictions and capriciousness, constitute an unbearable problem to many — because they are a reminder of the failure of government policies, of the schools, and of the family. A lasting solution is probably to be found in the balance between economic and social development that often eludes the planners' control — as it did in Costa Rica, a country caught unawares by the suddenness of its own development. □

*Denis Marcheterre is a freelance writer living in Costa Rica.*



# TAPPING THE FARMERS' WISDOM

*Farmers are becoming active participants in research rather than passive recipients*

NATHAN RUSSELL

**A** group of agricultural researchers in Africa is fomenting a revolution — not against the powers that be, but against the often cumbersome procedure by which new agricultural technology reaches farmers on this continent and elsewhere in the developing world.

Among the activists are members of Cameroon's National Root Crops Improvement Program (CNRICIP), which has launched a vigorous campaign to move root crops research onto farmers' fields. In 1982 it carried out 275 on-farm trials, and additional ones took place in 1983.

The objective of this work, according to Simon Lyonga, the program's national coordinator, is to "get farmers to participate more in solving their own problems." It is based on the radical assumption that farmers can be partners in research and that their observations and judgments can help guide researchers in seeking to improve farming methods. "We have always known that farmers are not fools," says Lyonga, "but now we are finding ways to take advantage of their wisdom."

CNRICIP is a cooperative venture involving Cameroon's Institute of Agricultural Research (IRA); the International Institute of Tropical Agriculture (IITA), which is providing technical assistance; and two donors, IDRC and Belgium's General Agency for Development and Cooperation (AGCD).

The problem being confronted by the program is partly institutional. In Cameroon, as in many other countries, agricultural research and extension are in two separate branches of government. Although this arrangement may make for a tidier organizational chart, it is not necessarily in the best interests of farmers, who have to wait a long time to get the benefit of improved crop varieties and researcher recommendations about the best cropping practices.

There are other impediments as well. Most agricultural researchers in the tropics have been trained to work under the artificial conditions of research stations, where they can manage their experiments relatively easily and feel assured that the results are reliable. These researchers are understandably reluctant to venture out into the much less certain environment of a single-hectare farmstead.

Researchers have also been hampered by a feeling that, before releas-

ing a new variety or technique to extension, they must be absolutely sure that it will succeed. Otherwise, if the innovation turns out to be a failure, their credibility with farmers may be irreparably damaged. True enough. But how will researchers ever achieve certainty about a new variety or technique until they have gotten farmers to try it?

Tapping the farmers' wisdom is no easy task, according to Herman Pfeiffer, an agronomist working with CNRICIP. It has taken him many hours of discussion with farmers to penetrate the inner logic of their often complicated farming systems and to understand the terms of reference they use in talking about their cropping decisions. But only by making this kind of effort can researchers establish what Pfeiffer calls a "continuous dialogue with



*Cameroonian farmer in an on-farm sweet potato trial. Photo: Nathan Russell/IITA*

farmers." And only through such a dialogue can researchers learn how best to intervene in traditional cropping systems with new technologies and afterwards determine whether the intervention was a success.

The on-farm trials carried out by CNRICIP in 1982 were of two types: researcher-managed "verification trials" and farmer-managed "demonstration trials." The former were conducted in southern and central Cameroon in cooperation with development organizations, church groups, and large farmer groups. The plots were laid out very much as they would be at an experimental station. Researchers made all the management decisions and evaluated the results.

The demonstration trials were much more the farmers' affair. Individuals or groups of farmers provided the land and all the labour, taking the yield as

their reward for participating. Each trial compared two improved sweet potato varieties with a local one commonly grown by the farmers. At harvesttime farmers came together for a field day to harvest the crop and make their own judgments about which variety yielded the most and produced the best quality tubers. They also considered the pros and cons of various cultural methods and cooked and ate the tubers on the spot to test their cooking quality and taste. At the end of the day, they took cuttings of the varieties they considered best back to their farms for "home multiplication" and further production.

The farmers were impressed with the yield and quality of the improved sweet potatoes. That is saying a lot when you consider that the "least significant differences" of statistical analysis are entirely meaningless to the farmers. Unless they can see a difference, they will continue to swear by their local varieties and traditional techniques. In most trials the best of the two improved varieties performed — statistically — 172 to 351 percent better than the local one.

Feedback from farmers is only one of the benefits CNRICIP researchers are gaining from their on-farm trials. Another equally important one is a stronger link with extension. Extension workers from the Ministry of Agriculture and private development organizations took part in the planning and execution of demonstration trials and also participated in the verification trials. These workers are placing themselves in the forefront of agricultural innovation in their country and becoming better equipped to channel research results into the hands of farmers. This is particularly important for extension workers in remote regions of the country since they do not have ready access to journals, technical bulletins, or other documents reporting the results of agricultural research.

Research and extension must find some common ground in order for both to work effectively. On-farm research can provide just such an opportunity. It puts the two in their proper relation by creating a continuous flow of information between those who generate and those who transfer technology.

Experimental station research is the foundation on which both on-farm research and extension rest. In only



five years CNRCIP has made remarkable progress in its station research, developing a whole range of improved varieties and techniques for on-farm testing and eventual release to farmers. At the experimental stations, researchers are concentrating on activities, such as genetic improvement, that require careful control and on production techniques that are as yet preliminary and too risky for farmers to try on their own.

Through selection from many local varieties and improved ones brought in from IITA, plant breeders have identified varieties of cassava, yams, and sweet potatoes that yield well and are resistant to the most prevalent diseases of these crops. Some of the varieties are still being tested; others, having gone through experimental station and on-farm trials, are ready to be released to farmers on a large scale. Among the most promising of these are two sweet potato varieties, T1b 1 and 527034, which, with funding from IDRC, are now being multiplied by the Ministry of Agriculture, one parastatal organization and the hundreds of farmers who have participated in on-farm trials.

CNRCIP's agronomists are also at an advanced stage in their work. They are putting together "packages" of improved cultural practices that should help small-scale farmers get the maximum return from improved varieties. Some of these practices are already being tested in farmers' fields.

The program's rapid progress is due in part to its capacity for self-criticism and its intolerance of busywork research that, as agronomist Jerome Ambe Tumanteh puts it, "answers questions that farmers never ask." These qualities manifest themselves in the way the researchers work with one another from day to day, in the monthly coordination meetings between IITA and Cameroonian scientists, and most particularly in the program planning meetings held every year just after harvest. In these meetings each researcher reviews past work and announces plans for the coming year. "We really argue it out, and we call nonsense what it is," explains Lyonga. Experiments that have no clear relevance to farmers' problems are either modified or discarded.

These rigorous evaluations serve to clarify the program's objectives and keep researchers from each discipline thoroughly informed about what the others are doing. According to Ambe Tumanteh, the sessions have other benefits as well: "You have to work hard to convince farmers, and these meetings give us plenty of practice."

To appreciate fully the importance of these achievements, it is necessary to view them in the context of international and national efforts to increase African food production, which, according to World Bank figures, has dropped in 25 African countries over the last decade. The technical means are rapidly being developed for arrest-

ing this decline and easing its calamitous effects on African economies. More than a decade of work by scientists at international agricultural centres, in cooperation with their national counterparts, has produced improved varieties of the continent's major food crops and modifications in its traditional farming systems that could go a long way toward alleviating the current food crisis.

What is still lacking, unfortunately, is the means for adapting these varieties and techniques to the diverse ecologies of Africa and transferring them on a massive scale to farmers. The burden of this task must be borne by national research and extension programs, but many of them are still at an

Lyonga, will soon enable Cameroonians to carry the program forward with little technical assistance from outside agencies. CNRCIP researchers have greatly profited from degree training at IITA and from the Institute's yearly root and tuber production courses. These training contacts have also provided IITA with a means for supplying a steady stream of new technologies to CNRCIP for adaptation and testing.

These efforts might have come to nothing, however, had the program not received solid backing from the Cameroonian government through IRA. From the beginning of root crops research in Cameroon, the government has demonstrated its seriousness about this work by offering large



*The results: a good harvest on sale at a roadside market near Buea in southwestern Cameroon. Photo: Nathan Russell/IITA.*

early stage in the slow and difficult process of institution building.

Much is now being done in some African countries to speed up this process through cooperation between international and national groups. CNRCIP is a case in point. The program was rapidly put on the path toward achievement through a creative combination of its own resources and those of IITA and the donors.

It is especially worthwhile to note the roles played by the national and international partners in this endeavour. IDRC and AGCD have provided funds not only to bring about capital improvements, but also to cover operating costs. Many development projects have foundered because donors were unwilling to go beyond their initial investment in buildings and equipment, which, for lack of additional funds, have fallen into disrepair and have never been fully utilized.

The donors have also invested heavily in training, which, according to

enough incentives to attract the best qualified Cameroonians and by making reasonable research allowances available to them. In addition to paying the salaries of CNRCIP researchers and technicians, IRA has provided land, housing, and research facilities. Already the major source of funds, IRA is assuming an ever greater share of the financial burden.

The contribution of the fourth partner in CNRCIP — the Cameroonian farmers — must not be overlooked. Their willing participation in on-farm experiments has proven to be crucial in confirming whether technologies that show promise at experimental stations will really make a difference in farmers's fields. By becoming active participants in research rather than passive recipients of its results, they have taken a radical step toward eventual transformation of food production in their country. □

*Nathan Russell is a writer/editor with IITA, Nigeria.*



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# FISH ON LAND

## AQUACULTURE IN SRI LANKA

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MARK ROGERS

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In Sri Lanka, a typical meal is a plate of rice with different curries to spice it up. But there has been a change in tastes during the past few years. More and more often, one of the curries is fish.

Sri Lankans have become increasingly aware of the importance of the protein fish can provide in their diet. But there is a problem: many of the people who need it most — the rural poor — simply cannot afford to buy fish.

By the time the fish reaches inland villagers from the coast, high fuel costs, and preservation and distribution problems have raised prices beyond the reach of poorer households.

The solution in other countries has been to develop inland fisheries. But Sri Lanka does not have a strong tradition of catching fish inland.

What little is done is inefficient and insufficient to meet the increasing demand. In order to fill the gap, the Ministry of Fisheries — with the support of FAO (Food and Agriculture Organization), UNDP (United Nations Development Program), and IDRC — is

attempting to develop a technology for low-cost fish farming and to promote it widely among fishermen and farmers throughout the country.

Indeed, the Ministry hoped to triple the inland fishery harvest of 16 000 metric tonnes in 1979, to 50 000 tonnes by last year. Coastal fishing, however, would still supply the bulk of fish with an estimated catch of 216 000 tonnes annually.

To meet this goal the government has started four programs involving intensive stocking of seasonal tanks — the large ponds that used to form an ancient irrigation system. The program will train aquaculturalists and improve methods of building fish stocks. With new incentives to popularize raising fish in inland waters, it is hoped that the harvest of protein from large and medium-sized tanks will be increased. The IDRC is supporting research aimed at developing techniques — such as cage and pen culture — for farming fish in the tank system.

Countries such as the Philippines, Thailand, Indonesia, Hong Kong, and Singapore have long used cage culture to grow and harvest fish in inland waters. Raising fish in enclosures eliminates the natural dangers that kill many adults and fish fry (young fish). As much as 90 percent of the original stock can be harvested. It is also much easier and cheaper to harvest from a pen or tank than to net fish

from open water. And fish culture provides a continuous production that supports a steady supply and income for the fish farmer.

The technique involves building a floating bamboo frame that supports a nylon net, placing it in a pond or tank, and stocking it with young fish. When the fry mature, they are harvested. The method is suitable for a number of species, among which are tilapia (*Tilapia nilotica*), carp, milkfish, and even trout. Tilapia was chosen for the Sri Lankan experiments due to the lack of seed for carp.

Tilapia are herbivores, feeding on plankton and plant detritus. They are well-suited to the warm, weedy tanks and canals of Sri Lanka. And they can be cheaply produced, which means that growing and marketing remain within the reach of lower income people in the villages.

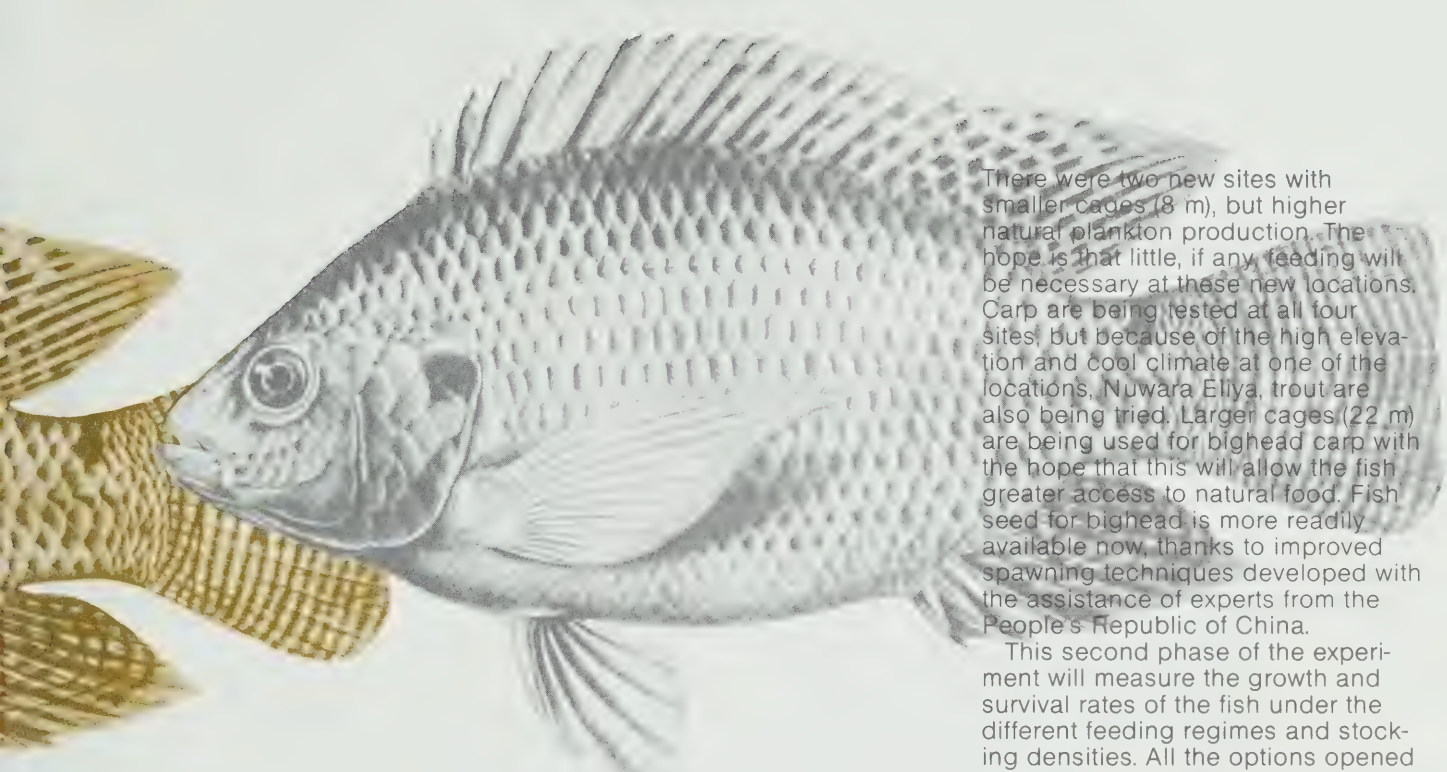
The Ministry of Agriculture intends to encourage Sri Lankan farmers living near tanks to undertake cage culture. Migrant fishermen, who work part-time on the coast but live inland, may also want to become involved if they can be shown it is profitable.

The process will, of course, be complex. What applies elsewhere in Asia does not necessarily apply in Sri Lanka. The Ministry of Fisheries has finished a first phase of the project to determine the technical and biological aspects of adapting cage culture to Sri Lankan conditions. A second phase, started in August of 1983, will continue the work and look at some new problems.

The first trials of technology developed in the initial phase began in September 1980. There were







(Above) *Tilapia*: a fish of culture.  
(Opposite page) Cageculture in inland waters: a floating harvest.

Line drawing: *Tilapia nilotica* from *Zoology of Egypt*, G.A. Boulenger, 1907.

many problems and the results were not conclusive. Twelve cages were introduced at each of four sites: Udawalawe, Polonnaruwa, Muruthawela, and Nuwara Eliya. It was found that wave and wind action during the seasonal monsoon broke the cages, letting the fish escape. There was poaching by other fishermen. Distribution problems within the Ministry meant fingerlings of a uniform size were not always available.

Researchers learned from the mistakes of the first trial. For example, the original cage structure, which was based on a model used in the Philippines, was reinforced with bamboo. And, since the metal barrels that had previously been used as flotation devices tended to weaken the structure at certain points, they were replaced by bamboo platforms. The most economical of the structures tested was a 27-cubic-metre model that cost 50 Rs (about CA\$3) per cage. Greater supervision was planned to cut down on poaching and the Ministry agreed to take steps to ensure that there would be an adequate supply of fingerlings.

The researchers also analyzed the results of biological tests which showed that the growth rate of the tilapia was inadequate. In the first trial, different stocking densities — the number of fish placed in a cage — had been tested. The fish in some cages were fed 5 percent by body weight of a supplementary feed manufactured at the Institute of Fish Technology. Others were left to feed on the natural plankton in the reser-

voirs. It was discovered that the natural feeding was not enough to support the growth of the fish, and that cage culture would not be viable if they were kept at the original stocking densities.

Researchers estimated that the cost of feeding represented about 60 percent of the cost of production, so efforts were directed at finding a more economical supplementary feed. The objective was to keep the feed price low enough to produce fish at a price that was competitive with fish caught in nets. In the second trial, beginning in July of 1982, the stocking densities were increased to between 200 and 450 fish per cubic metre, up from 50 to 75. All the fish were to be provided feed — some with the original supplementary feed, and others with a low-cost feed produced from local ingredients. The new feed cost 2.2 Rs (about CA\$ 0.15) per kilogram and was made up of fish meal (20%), rice bran (50%), and chicken manure (26.5%), with vitamins and oil added. Researchers considered the results of the first experiments valuable enough to go on to a second phase. They had learned what biological and economic conditions were needed to make cage culture viable in the main climatic zones of the country. They had identified a need for a related study on the natural food productivity of different water bodies. And, they had designed a stronger cage and developed an inexpensive feed for use under Sri Lankan conditions.

The second phase started in August 1983 with trials at four sites.

There were two new sites with smaller cages (8 m), but higher natural plankton production. The hope is that little, if any, feeding will be necessary at these new locations. Carp are being tested at all four sites, but because of the high elevation and cool climate at one of the locations, Nuwara Eliya, trout are also being tried. Larger cages (22 m) are being used for bighead carp with the hope that this will allow the fish greater access to natural food. Fish seed for bighead is more readily available now, thanks to improved spawning techniques developed with the assistance of experts from the People's Republic of China.

This second phase of the experiment will measure the growth and survival rates of the fish under the different feeding regimes and stocking densities. All the options opened up in research will be monitored for cost, making it easier to choose between them.

If a viable system of culture can be found, researchers would like to test a multigrade cage-culture system that would allow year-round harvesting. This would involve using a series of cages. The first one would be stocked and as the fish grew, the largest would be taken out and placed in the next cage. The first cage would be replenished from a reservoir. As the fish continued to grow, the largest in each cage would be moved down the series. Rather than having to wait for a harvest once every six months, the last cage in a multigrade system would produce a continuous supply of fish.

The Ministry of Fisheries in Sri Lanka is becoming more interested in pen culture. Rather than floating as a cage does, a pen is a stationary structure fixed to the bottom of a waterway by poles and enclosed on the sides by netting.

Cage and pen culture show signs of catching on. Already, fishermen who have seen the experiments have been making inquiries. This will make it easier to carry out the objective of the second project phase of getting people to use the technology refined in testing. Extension workers are being trained and fishermen and farmers will be invited to seminars at two Ministry of Fisheries stations.

More and more, Sri Lankans are demanding fish in their diet. Fishermen and farmers seem increasingly interested in supplying it. The only thing missing is the means of producing the fish, something that research may soon be able to add to the food equation. □

Mark Rogers is a Canadian journalist with a special interest in development who visited the inland fisheries project in Sri Lanka.



## OBSERVING THE OVERLOOKED

### NEW WAYS OF RESEARCH ON WOMEN

**A**s the number of studies focusing on women's conditions — particularly their economic circumstances — increases, it is becoming evident that such taken-for-granted concepts as "work," "economically active" person, and "labour participation" have not been defined in ways that capture the nature of women's roles in productive and reproductive activities.

National censuses in many developing countries seriously underestimate the economic role of women in agriculture, in a range from between 14 percent to 40 percent of the actual rates.

Definitions of work, usually in terms of the salaried activities undertaken during a given calendar week called the "referent week," fail to capture many productive economic activities of

women that are discontinuous, that is, part-time, seasonal, or performed concurrently with other tasks within the home.

Definitions of "participation" that are limited to the context of formally organized groups fail to consider the informal networks or associations through which many women operate.

Such definitions thus have only tended to produce a picture of women as passive subjects and have not helped to identify successful mechanisms to enhance women's development.

The concept of "women in development" itself is still in the process of being defined. Although there is yet no consensus on what it implies, it generally is taken to refer to the status and role women have and should have in developing societies. As a result, it is undeniable that the study of women's issues often reflects a value position regarding the appropriate place of women in society.

Although common social science methods such as the questionnaire and the structured interview have been successfully applied in a number of studies dealing with women in the field of population, in many areas

of social science research they are proving to be somewhat limited when applied to women.

Because of their low levels of education, their limited contact with written stimuli, and their lack of communication with individuals external to community or family networks, disadvantaged groups — especially women — do not always react favourably to questionnaires and structured interviews, often administered by higher status male researchers. In addition, research experience is showing that women are likely to produce distorted answers, particularly in areas such as economic activities where women's involvement is not culturally sanctioned.

In dealing with women, then, researchers are becoming increasingly aware of the need to turn to complementary and much more interactive techniques of data gathering. One technique is the use of group discussions where, through the dynamics of small group behaviour with the researcher in the role of discussion facilitator, women engage in thematic discussions and explore common problems not readily divulged on an individual basis.

Gathering life histories, through which close and frequent contact with selected women enables the researcher to reconstruct the women's past experiences, and in so doing to trace the relationship between women and family and between family and society is another more interactive technique. (This technique uses unstructured interviews, usually the so-called biographic interview, which focus on the respondent's own experience). Testimonials, in which the researchers explore particular experiences of a woman's life in order to describe in detail their intensity, frequency and impact is yet another new data-gathering instrument.

Role playing in informal dramatizations through which researchers enable



*Classical interview in Chile: women may distort answers responding to male interviewers.*



women to re-enact experiences or convey perceptions or opinions otherwise repressed is also useful.

These techniques have already been used in several population studies but are only beginning to be applied in economic, sociological, political and educational research. They are effective not only in allowing women to express themselves more directly and naturally, but also in creating settings that are much more likely to encourage responses. Thus, they bring the women into contact with their peers and often place them away from the home in a climate more open for discussion. As with any research method, these methods are limited to the extent that the groups of women so gathered may not always represent the full gamut of women's conditions and attitudes in the community (for instance, it is likely that the most isolated and overworked women will still not participate). On the other hand, however, the group discussions and role playing activities facilitated by the group setting allow faulty information to be corrected by the participants. As discussions emerge on a number of individual and community practices, the consensus expressed by the group on certain issues will enable the researcher to verify the information. Also, group discussions allow the researcher to question immediately what might be perceived as discrepancies in the information obtained.

The need to develop instruments that do not meet with cultural and psychological resistance among women also leads to the use of more observational and qualitative modes of data gathering. An increasingly popular method, particularly in studies seeking to capture the full extent of women's agricultural activities, is the time-allocation technique that, rather than asking a woman whether she "works" or not, develops instead a detailed schedule of her daily activities including

production, supply and distribution of foods and crops; household; community; personal needs; and freetime activities. This technique (which also has been applied to other household members to obtain comparative data) can be obtained through recall methods, observation, or personal diaries.

For some observers, the tendency to depend increasingly on qualitative approaches to the analysis of women's issues raises concern about the standards of validity and reliability of such studies. These are, of course, legitimate concerns. They usually can be satisfied by providing ample background on the type of informants reached, the frequency and intensity of the observations and discussions with the subject under study, and the criteria used to identify or establish categories to guide the interpretation of the qualitative data. In short, these procedures would closely resemble those used and accepted in anthropological and ethnographic studies.

UNITS OF ANALYSIS

Progress in the understanding of women's economic roles has been achieved through analyses focusing on the "household" and the "domestic unit," rather than on individual respondents, who usually have been men. The household, generally defined more rigorously than the "family," and conceived as a locus for production and reproduction, has permitted a fuller appreciation of the contribution of women to the economy at the micro level and their role in survival strategies, particularly in urban settings. The "domestic unit," defined to include the network of immediate relatives and friends in the community, has also been beneficial to the understanding of the active and key role that women play in the attainment of agricultural production in rural areas.

At the same time, however, a great deal of criticism is developing

about these units of analysis. The main objection is that the social groups they describe are not homogeneous but are themselves based on internal hierarchies, i.e., differences in decision-making power among the members of the household.

Another unit of analysis that is emerging, not as an alternative but rather as a

to be problem-focused. There is a distinct tendency among some of these women to do research on women for women and with women. In consequence, collaborative action-research as a research approach is not uncommon, especially in the case of research originating in Latin America and parts of Asia. This means



Group discussion in Bangladesh: a self-correcting activity.

complement to the aggregation of individual data presented by census and national surveys, is the community- or village-level study. By focusing on a smaller system, but doing so as an interacting whole, researchers anticipate obtaining a more thorough understanding of women's conditions.

RESEARCH APPROACHES

Although in principle all researchers should be concerned with understanding the role women play and can play in the development process, the fact is that those most interested in women's issues have been women themselves. (At least 90 percent of the authors in bibliographies dealing with women's issues are women.)

Although not an overwhelming phenomenon, women engaged in researching women's conditions tend also to be persons involved in specific projects to improve the conditions of women. Since for them action is important, their research tends

that the women being studied tend themselves to participate in problem definition, data-gathering activities, data analysis, and eventually the identification of solutions. It should be noted that action-research is not limited to women's studies, but that it tends to be a commonly used approach, seen more frequently in certain fields such as nonformal education than in population or economic studies.

In sum, research on women's issues presents special methodological challenges. Improvements have been made regarding some concepts, instruments, and analyses but many others are yet to be devised. Among the issues to be resolved are the problems of taking data together as a whole, moving from the realities of the household and community to larger issues that can serve to illuminate national policies. □

*This article was produced by the Social Sciences Division of IDRC as part of a policy paper on research related to women.*



## A prized discovery

Two American scientists, one working in Bangladesh and the other in the United States have won the 1983 King Faisal International Prize in Medicine for their contribution to cholera research. The scientists, Dr William B. Greenough — director of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) — and Dr Michael Field — professor of gastroenterology at the University of Chicago — are being honoured for discovering the precise mechanism whereby the toxins produced by cholera bacteria, and more common diarrhoeas, cause the rapid loss of bodily fluids.

Basically, they discovered that the cholera toxin mimics the action of a normal intestinal hormone by attaching itself to intestinal cells and instructing them to produce a chemical that sparks fluid secretion, CAMP (adenosine-3'5'-cyclic monophosphate).

But unlike the hormone, the toxin remains stuck to the cell — apparently for its lifetime — inducing the production of more and more CAMP and setting off endless secretion. The body is thus drained swiftly of essential fluids and minerals, and unless these are replaced quickly, the victim has a 50:50 chance of going into shock and dying.

The scientists also showed that while the cholera toxin sparks fluid losses, it does not interfere with the simultaneous absorption of fluids in the presence of glucose. This explains the remarkable success of oral rehydration therapy, whereby a salt/sugar/water solution is used to replace the liquid and salts lost in diarrhoeal disease attack, the sugar acting chemically to help the water and salt to cross the intestinal cell membranes.

Not only has the discovery had tremendous impact on the diagnosis and treatment of cholera — for example, by enabling scientists to develop

antisecretory drugs that inhibit or reverse cholera-caused fluid losses — it has also contributed to our understanding of basic hormonal and cell secretion processes.

## Rolling in clover

Home to some 40 different species of clover, the Ethiopian highlands are thought to be the world's second most important centre of genetic diversity for the useful legume. Yet, little is known about the potential of indigenous clovers as forage crops in Ethiopia.

Now, two scientists at the International Livestock Centre for Africa (ILCA) have demonstrated that the yield of some local clovers, in terms of dry matter, can be increased approximately sixfold through low-to-moderate applications of phosphorus. Moreover, the indigenous clovers performed better than imported commercial species under similar conditions.

The discovery makes the economics of forage cropping in the African highlands look suddenly brighter. If the legumes can be started with moderate amounts of phosphorus, they can be used to "drive" the agricultural system, supplying most if not all of the nitrogen needed by the food crops (through a natural synthesis by bacteria that adhere to the roots of most legumes). Cheaper local clover seed can be used instead of imported lines, and only the addition of phosphate fertilizer will be required in the cropping cycle. This will lower the cost of producing both forage and the food crops that follow them.

A number of questions remain to be answered before the clovers' potential is realized — not the least of which is whether farmers will recognize the superior feeding value of a legume over a grass hay, and be prepared to pay a higher price to produce it. Scientists at ILCA are optimistic, however, and are proceeding with further plant exploration and trials.



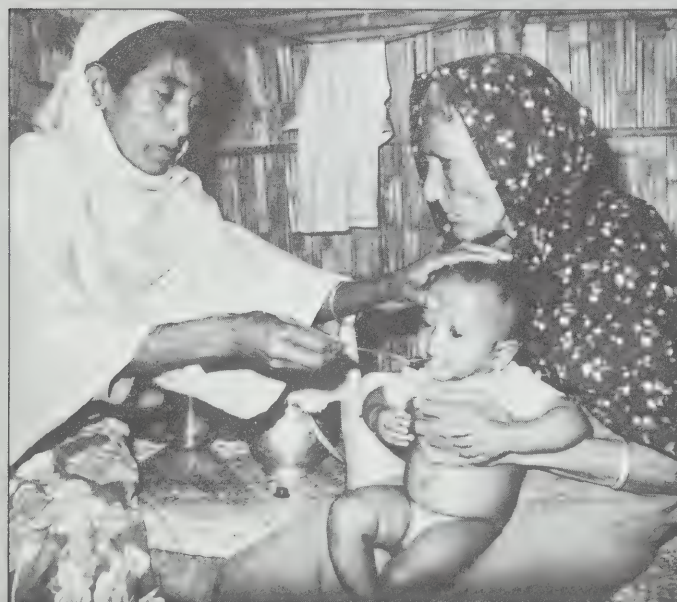
*Greener pastures for clover.*  
Photo: ILCA

## Agricultural communication struggles to be heard

A communications unit within an agricultural institute can greatly speed up the process of disseminating research results and putting them to use. But adequately staffed units are few and far between in agricultural universities, research institutes, and extension organizations in developing countries. The sticking point seems mainly due to the shortage of communications specialists trained in the field of agriculture.

In order to discover the extent of the problem, the University of Agricultural Sciences, Bangalore, India, with the assistance of the International Rice Research Institute, the Philippines, conducted a mail survey of 151 institutions in nine Asian countries to determine what kind of information services they offer, what professional personnel they employ, and what their training needs are.

A majority of information units offered a range of technical services in-house. In descending order of frequency, these included: photography, editing, library, graphic arts, technical writing, and mailing services; audio-visual production; and information retrieval. Teaching and extension organizations offered a wider range of services than did research institutes. Printing and



*Oral rehydration, Bangladesh: a critical discovery.*



typesetting services and audiovisual materials were generally procured outside.

Ninety-nine percent of the information officers and administrators questioned declared that lack of adequately trained staff was a major constraint in their operations, followed by inadequate financial support (81 percent), and lack of equipment (79 percent). Teaching and extension organizations complained of "low government priority for communication activities" and 56 percent of the extension organizations indicated "bureaucracy and red tape" as a problem.

A majority of the respondents felt the need for one or more information professionals educated to the graduate level in development communications theory and in management of information systems. Indeed, most of them had, themselves, neither a degree in agricultural communications nor on-the-job training. Priority short-term needs — i.e., those that could be met by 4–8 week courses — were identified as technical writing and editing, audiovisual production, and information retrieval. But despite the fact that most organizations allocate 1–3 percent of their budgets to information services, the majority of the respondents indicated that no funds were available, either within the organization or from government, for training personnel abroad.

The results of the survey indicate that research and educational organizations have established information units, but that these need to be strengthened and upgraded by means of training. In view of the great need and limited availability of funding, it would seem advisable that a committee of experts in agricultural communication be set up to identify funding agencies and appropriate educational institutions for the task of training the trainers of the next generation of agricultural communicators.

Gowdar Somasekharappa

### **New method of diagnosing urinary schistosomiasis available**

In many tropical and subtropical countries, schistosomiasis is second only to malaria as the major public health problem.

Schistosomes are blood flukes, or parasites, that live in the veins of the bladder, intestine, or liver in their human hosts. The parasitic fluke must also spend part of its life cycle in a certain type of freshwater snail. In urinary schistosomiasis, for example, the fluke lays its eggs in the bladder of the human it has invaded. The eggs work their way through the tissues, and are eventually passed out in the urine. If the eggs reach fresh water, they hatch, producing larvae that swim freely until they find the right kind of snail host. There, they develop and multiply, and after a few days are released as tadpole-like "cercariae."



*A simple and saving test*

Photo: K. Mott/WHO

Cercariae penetrate the skin of people swimming or wading in infested water and work their way back to the bladder: the circle of infection is complete.

Light infections with urinary schistosomiasis often get better by themselves. But heavy infections can irritate the bladder and cause a form of cancer. The cancer frequently occurs in agricultural workers under 50 years of age in endemic areas... currently, large areas of 74 countries.

Control of the disease depends on early diagnosis. But until recently, there was no

simple method available for detecting or taking urinary egg counts under field conditions.

Now that problem may have been solved. An American-based nonprofit organization — the Program for Appropriate Technology for Health (PATH), in Seattle — has come up with a simple diagnostic method that provides reliable schistosome egg counts without recourse to electricity, delicate equipment, or highly trained laboratory personnel. The membrane filter technique, as it is called, involves drawing 10 ml of mid-day urine into a syringe and slowly injecting it through a filter. The filter membrane, which traps the eggs, is then placed on a microscope slide and examined using low power 10X or 40X magnification. The eggs can be seen without staining the specimen and can be counted. Moreover, the method is quick — the entire process of preparing and reading takes only 1–2 minutes per specimen.

The equipment necessary for performing the test is available in the form of a kit. Further information on the PATH Urinary Schisto Diagnostic Kit may be obtained by contacting: PATH, Canal Place, 130 Nickerson Street, Seattle, Washington, 98109, U.S.A. PATH also offers an instructional slide presentation, available in English, French, and Arabic, which provides a step-by-step demonstration of the technique.

### **Universal childbirth picture book**

"Everywhere in the world, a correlation can be made between the education of women and the reduction of pregnancies," says editor, publisher, and women's advocate Fran Hosken in an article in the *Humanist* magazine. Yet family planning organizations have failed to address the issue of women's education — especially health education — such that most African women continue to be ignorant of the facts about childbearing and

fertility and to be governed by many damaging myths and taboos. In order to "lift this ignorance that keeps women in bondage and destroys their health," the Women's International Network (WIN) News has developed a teaching aid called the Universal childbirth picture book. Intended primarily for community health workers, the book tells the story of reproduction in line drawings depicting women of various racial and ethnic groups. Trials of the book have demonstrated that it is readily understood regardless of language or literacy and can be easily adapted to local needs. Further information: WIN News/Fran P. Hosken, 187 Grant Street, Lexington, Mass. 02173, U.S.A.

### **Nigeria's braille code acclaimed**

African nations and international educational institutions have acclaimed the braille codes recently developed in Nigeria for the West African nation's three main languages — Hausa, Igbo, and Yoruba.

The idea of developing braille symbols in Nigerian local languages was first adopted in 1973 when educators of blind people were faced with the problem of transcribing Yoruba textbooks into braille.

Mrs. Frances Anunmonye, then resource leader at the Pacelli School for the Blind in Surulere, Lagos, assisted by another blind teacher, Mr. Paul Ajunwa, devised experimental codes to help their students move on to postprimary institutions, where the teaching of Yoruba language was compulsory.

But researchers still faced the major problem of tonal marks in the three main languages. Aware that in Igbo, for instance, akwa could mean cloth, egg, cry, or bed and that the difference was carried on tonal marks, the researchers at the Nigerian Educational Research Council (NERC) devised high, mid and low



tonal marks in braille. Similar problems existed in Yoruba and in Hausa. But new, common tonal marks that differentiate the words have also been devised.

Mrs. Anunmoye, now assistant chief education research officer at NERC, and a team of council researchers standardized, then tested the symbols in various blind schools in Anambra and Imo, Lagos and Ondo, and Kane and Kaduna states, where the three languages are spoken. From the outcome of the field tests, the unique braille code in the three main languages was born.

The remarkable achievement has, however, created a new scarcity in the wake of its success. The NERC is unable to turn out enough textbooks in local languages for students due to the absence of a Braille press in the country.

*Abiodun Lewis*

### **Raising fish in paddy fields — a rice grower's way to wealth**

Zhou Guihou, a south China rice grower, recently became famous in his home town — Xintian Commune, Yichun County, Jiangxi Province — for building up a family fortune by raising fish in paddy fields.

Fish breeding has earned him 12 500 yuan (about US\$6250) in the past three years. This is a good sum of money, considering that an average young state farm worker

can earn only 540 to 600 yuan (US\$270 to \$300) a year.

Though breeding fish in paddy fields is a promising road to wealth, only a few rice growers raised fish in their fields before 1979, when the Chinese government called on its people to become rich through hard honest work and instituted the "responsibility system." This links the peasants' income with their output, thus greatly stimulating their enthusiasm for enterprises like Zhou's.

In 1982, 174 experimental fish-raising centres were set up in Yichun County alone to train rice growers in scientific methods of breeding fish in paddy fields.

Chinese peasants now raise fish in about 556 000 hectares of rice fields with an annual output of 40 700 tonnes of fish. China has more than 25 million hectares of rice fields. Generally speaking, rice growers can reap 100 to 150 kilograms of fish per hectare, while some experienced farmers can harvest as much as 700 kilograms.

Breeding fish in paddy fields has other benefits besides bringing wealth. According to Professor Ni Dashu of the Institute of Hydrobiology of the Chinese Academy of Sciences, it can also increase grain output. "Fish can devour harmful insects, help free the paddies from weeds and loosen and fertilize the fields," he said.

"The grain output of fish-raising fields is, generally speaking, 10 percent higher than that of the non-fish-raising fields," he added.

In May 1982, peasants of Hudong Production Brigade in Xinghua County, Jiangsu Province, conducted the experiment of breeding fish in a paddy field of 0.3 hectares in order to compare its output with that of a neighbouring paddy field of the same size in which no fish were bred.

Not only did the fish-raising field have a 37 percent higher yield than the non-fish-raising field, the rice in the fish-raising field was more robust.

Although all kinds of crucians can be bred in rice fields, people usually raise grass carp since such fish are the best in suppressing weeds, eliminating destructive insects and not harming crops, Professor Ni noted.

Raising fish in paddy fields can also eradicate the mosquitoes, which previously carried the serious diseases of malaria, filariasis, and encephalitis to Chinese farmers.

Studies by the Henan Medical College have shown that the presence of grass carp and other fish in paddy fields has resulted in an 80 to 90 percent reduction in the density of mosquitoes and their larvae.

*Dai Adi, China Features*

### **Regional workshop on information management**

The German Foundation for International Development (DFG), jointly with the Eastern and Southern African Management Institute (ESAMI), is organizing a regional workshop on the management of information services, to be held in Arusha, Tanzania, between October 22 and November 2 of this year. Topics covered at the workshop include the role of information services, planning an information service, resource sharing, methods of documentation, and international information systems. The participants will be selected from among staff in li-

braries, documentation centres, and archives in Eastern and Southern Africa. For information: Augustus Musana, Chief Librarian, ESAMI, P.O. Box 3030, Arusha, Tanzania or P.O. Box 56628, Nairobi, Kenya.

### **Southeast Asia gets nitrogen fix**

Biological nitrogen fixation (BNF) is that wonderful process whereby certain legumes can assimilate free nitrogen from the atmosphere with the help of rhizobium bacteria in nodules on their roots. The nitrogen thus obtained can be added to soils if the legumes are plowed under as "green manure." The planting of legumes in rotation with other crops provides a low-cost natural method of restoring soil fertility.

The University of Hawaii (U.S.A.) has begun a program of BNF by tropical agriculture legumes — NIFTAL, for short — aiming to encourage the adoption of technologies based on BNF as an alternative to nitrogen fertilizers in the developing world. The program includes training for all those involved in the delivery of the new technology — policymakers, research scientists, inoculant producers, technicians, and agricultural extension workers — and is offered in the form of courses, workshops, internships, and research assistantships for PhD candidates.

Last year, NIFTAL took the first step toward the regionalization of its services with the establishment of the Southeast Asia BNF Resource Center in Thailand. The centre will attempt to adapt BNF technology to local conditions by offering research support, training, and responses to specific requests for assistance. Similar resource centres for Africa and Latin America are to follow.

For further information: Dr Douglas Beck, Rhizobium Building, Soil Microbiology Branch, Division of Soil Science, Department of Agriculture, Phaholyothin Road, Bangkok, Bangkok, 10900 Thailand.



*A double bounty: rice and fish. Photo: China Features*



**Tropical root crops: production and uses in Africa.** E.R. Terry, E.V. Doku, O.B. Arene, and N.M. Mahungu, editors. Published May 1984, 231 pages, IDRC-221.

A mixture of original research, updates on procedures, literature reviews, and survey reports, this document resulted from the second symposium of the International Society for Tropical Root Crops - Africa Branch, with 77 participants from 16 countries. The focus was cassava, yams, cocoyams, and sweet potatoes, from the perspectives of breeders, agronomists, soils specialists, plant pathologists, entomologists, nutritionists, food technologists, etc. Learning from past successes and failures, many of the researchers directed their efforts toward problems obstructing progress in reaching improved production and use of root crops and attempted to view, realistically, the context in which their results would be applied.

**Coming full circle: farmer's participation in the development of technology.** Peter Matlon, Ronald Cantrell, David King, and Michel Benoit-Cattin, editors. Published May 1984, 176 pages, IDRC-189e.

Involving farmers in identifying the constraints to rural agriculture and in designing measures to alleviate them is the subject of this publication, which resulted from a meeting, held in Ouagadougou, Upper Volta, 20-25 September 1983. Agronomists, economists, anthropologists, and others seeking to get the most from research efforts discussed the pitfalls of assembling packages that are sound technically but have some essential flaw because the developers have overlooked some crucial constraint at the farm level. The subject is

one that is receiving much attention currently as agriculture in developing countries has failed to net major increases in production despite thousands of dollars invested in research and optimistic claims that improved varieties, techniques, equipment, etc. have been developed. The gaps between results on research stations and those on farms in the Third World have prompted some researchers to view the farmers' conditions as the real laboratories. Why, how, where, and when to get farmers involved in research are the focus of this document, and the degree to which researchers and the agencies they represent have been able to listen and work with their new partners varies, as is clear from the 11 papers and the commentary that follows them.



**Crop improvement in Eastern and Southern Africa: research objectives and on-farm testing. A regional workshop held in Nairobi, Kenya, 20-22 July 1983.** Roger Kirkby, editor. Published May 1984, 122 pages, IDRC-218e.

This workshop brought together a small representative group of scientists working in food-crop improvement programs in eastern and southern Africa to discuss planning,

conducting, and developing such programs. Emphasis was placed on those methodological aspects, common to most crops grown by small-scale farmers, that contribute most to the likelihood that the research results will be utilized by the farmer.

Contained within these proceedings are brief accounts of the local varieties grown and cultivation practices currently employed, institutional organization for crop improvement, specific objectives of programs and how these were established, and evaluation procedures used in arriving at a new recommendation for extension. Also included is a summary of a discussion session that looked at the organization of crop-improvement programs, setting of technical objectives and application of selection criteria, and methodology for mul-tilocation and on-farm testing.

**Comunicación entre grupos: el método del cassette-foro.** Mario Kaplún. Published in May 1984, 111 pages, IDRC-TS45s (Spanish).

Cassette-Forum is a system of communication for community development and adult education; it is suitable for use in both rural and urban settings by cooperatives, adult-education centres, community organizations, etc.

The method involves group discussions and feedback through taped messages on cassettes. Members of organizations carry on a dialogue with each other and with a central coordinator who initiates discussions through tape-recorded comments relevant to the

communities and draws from tape-recorded replies for future cassettes.

In this book, the designer of the Cassette-Forum, Mario Kaplún, details the method and reviews experiences in different countries in Latin America. In the final chapter, he also relates other methods of participatory communication that are being used in the region.

**SALUS: low-cost rural health and manpower training: an annotated bibliography with special emphasis on developing countries, volume 11.** Rosanna M. Bechtel, editor. Published May 1984, 134 pages, IDRC-222e.

This is the eleventh volume of a series of bibliographies that compile and coordinates information, both published and unpublished, on non-traditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and use of health workers.

**Devindex 1983: index to selected literature on economic and social development/ Index d'ouvrages sur le développement économique et social.** Published May 1984, 222 pages, IDRC-223e, f.

The ninth in the Devindex series, this volume contains entries from the Netherlands, the Soviet Union, Sri Lanka, and Canada. Topics include: prescriptions for decision-making; development action-operational experience; consequences and evaluations; and resources and tools for development. Annotations are in English and French.





**I**n addition to IDRC *Reports*, the Centre publishes a wide range of material on development issues. These include scientific monographs, reports, and bibliographies on specific IDRC research areas, as well as general interest literature. These publications represent research interests and activities supported by IDRC in agriculture, food and nutrition, population, health, education, information, and social sciences. Films describing the Centre and some of the areas of development research are also available. A catalogue of current material, publications or films, is available from the nearest IDRC regional office or from IDRC in Ottawa (see page 3 for complete addresses).

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VOLUME 13, NUMBER 3 — OCTOBER 1984

# Reports

THE  
IDRC



## **Handpumps**

- refugee education
- surviving poverty
- sexually transmitted diseases





# LETTERS

## Kind words

I have received your magazine since participating in a Canada World Youth Exchange to Colombia in 1979-80. Although my area of work and my location have changed many times since then, I look forward to *Reports*, which is forwarded from my parents' home in Saskatchewan. *Reports* gives me a continuing awareness of what's happening, and keeps me abreast of the realities.

As in the past, I am presently employed full-time in a church organization and working with youth. I have found that *Reports* gives these youth a chance to begin to see a world they've never realized existed, a world where many people are making a difference, at a time when otherwise it seems like individuals can do so little.

Thank you for the high quality of your magazine and your sharing of this kind of information.

Chairmaine Chvala-Smith  
c/o North Battleford  
Saskatchewan, Canada

## Ethics in human research

I would like to thank *Reports* for raising issues of ethics in human research (*Reports* 13(1) April 1984). Robert Charbonneau is right to call attention to the field and

the need to think about problems before they arise, rather than sort them out afterwards.

However, Robert Charbonneau opens discussion with what many people will find an inappropriate example. In commenting upon the use of Depo-Provera as a contraceptive he said, "In effect, an experiment involving millions of women is under way in developing countries — one that would not be permitted in the country where the drug originates."

In fact, the drug is made in Belgium where it is approved for use as a contraceptive. It has just been approved in the United Kingdom for that purpose, and the well-known nonapproval by the Food and Drug Administration (FDA) [in the U.S.A.] is currently under review. More importantly, the FDA has been explicit in saying that their decisions do not necessarily apply to other societies with different clinical needs and social attitudes. Indeed, the very arguments that Charbonneau makes about the need for sensitivity to different cultures can be legitimately turned around to apply to arguments for the availability of injectable contraceptives in a number of countries.

While coercion and the

inappropriate use of drugs would be an unacceptable error, it can also be morally wrong to unilaterally deny needed drugs through a form of medical colonialism that says only developed nations can make appropriate drug regulation decisions.

Malcolm Potts  
Durham, U.S.A

## Pueblito — caught in the middle

Your article on abandoned children in Costa Rica was timely and interesting ("Lost and found," *Reports* 13(2) July 1984). Your mention of Pueblito prompts me to write more of the circumstances of the villages.

Since its inception in 1975, the Pueblito village has had self-sufficiency as its goal, and by 1980 it was right on target. Eighty percent of the villages' funding came from within Costa Rica — from the Costa Rican government, private donations, and income from the small business enterprises located in the village: a bakery, henhouse, and farm.

But then came the recession. The level of Costa Rican government support was drastically reduced, and with the country's economy in a shambles, Pueblito's small businesses could not expect to remain unaffected. "Businesses have been going bankrupt across the country," said an official at the Canadian embassy in Costa Rica, "so we couldn't expect Pueblito's enterprises not to feel the pinch." And, by the end of 1983, the henhouse, the bakery, and the farm had all suspended operations, leaving a small dairy project as the only working business.

To make up for the shortfall, Pueblito Canada has gradually increased the support it gives the villages, to maintain a constant standard of living. Despite the country's difficulties, the youngsters have continued to thrive.

Through these hard times, the commitment of Costa Ricans to Pueblito has not wavered, and signs of an improving Costa Rican economy give them hope. They plan to re-open the small business enterprises later on this year, and have begun two new farming projects. They feel that self-sufficiency is a realistic goal for the villages, and that achieving that goal will allow them to better serve even more children of the street.

David Morley  
Executive Director  
Pueblito Canada  
Toronto, Canada

*Letters from readers are welcomed, and should be addressed to:  
Editors, IDRC Reports, P.O.  
Box 8500, Ottawa, Canada  
K1G 3H9.*



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief:* Rowan Shirkie. *Associate Editor:* Jacques Dupont. *Spanish edition:* Stella de Feferbaum. *Layout:* Alice Herczuk. *Staff photographers:* Neill McKee, Claude Dupuis. *Editorial assistant:* Kathryn Sauvé.

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**Cover photo:** Afar children in Ethiopia get clean water using a plastic pump developed with IDRC support. More than 20 million handpumps will be needed by the year 2000 to provide for the needs of rural people. See stories beginning page 4. **Back cover:** Refugee child in camp, northeast Thailand. Education may make the difference between a return home or an unsettled future. See story page 12.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 62084, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Repub-

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Unsolicited manuscripts and other editorial materials are welcomed and will be considered for publication.

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# A LIFT FOR WATER SUPPLIES

## HANDPUMP RESEARCH

DONALD S. SHARP

**W**ater is essential for life. But water contaminated with disease-causing organisms can be just as deadly as no water at all. Three-quarters of the estimated three billion people living in developing countries do not have access to adequate potable water supplies or sanitation facilities. The most seriously affected are those living in rural areas. Even more disturbing is the fact that it is children — under five years of age — who suffer the most.

In response to the clear and urgent need for improved water supplies and sanitation facilities, the United Nations declared the 1980s as International Water Supply and Sanitation Decade.

The goal of the concentrated development decade is to provide adequate water supplies and sanitation facilities "for all" by 1990. This enormous and ambitious task requires a vast commit-





ment of resources. Providing clean water requires political will, technical expertise, financial and material resources, all supported in a management structure capable of realizing plans as programs of action.

In areas where groundwater is readily available, the handpump is the simplest and least costly method of supplying safe drinking water. By the year 1990, some 1833 million (1.8 billion) people in the Third World (excluding China) will require new, clean water supplies. Almost 1400 million (1.4 billion) of those will be living in rural areas. To provide water supply services for many of these people, approximately 20 million or more handpumps may be needed by the year 2000. Replacement pumps will be needed for at least 500 million people during this same period, adding another 2.5 million pumps to the total requirement.

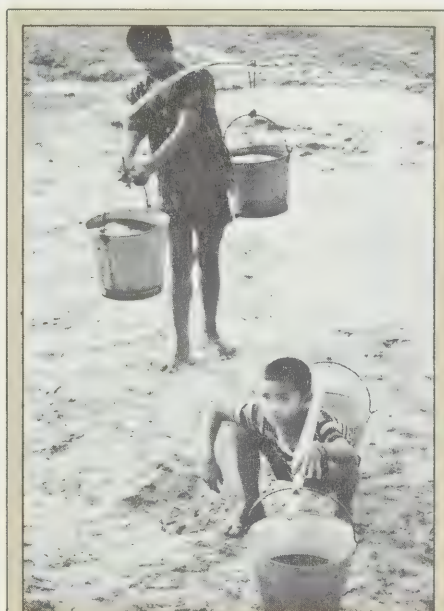
The development of reliable handpumps that can be locally produced, installed and maintained at a reasonable price would be a major step toward providing reliable, safe drinking water supplies to those who need it most — the rural communities. Due to technical, social, and economic reasons, rural people in the developing world will be dependent on manual pumps for many years to come, not only for drinking water but also for water for other domestic uses, livestock, and small-scale irrigation.

The cost of a handpump varies from a low of about US\$20 (CA\$26), for a simple shallow-well pump, to a high of around US\$2000 (CA\$2600), for a heavy-duty, deep-well pump. The average cost per handpump is about US\$150 (CA\$195). The World Bank reports that in one East African country, where the government is committed to developing rural water supplies, the average maintenance cost per pump per year is approximately US\$400 (CA\$525). The International Reference Centre for Community Water Supply and Sanitation put the minimum cost to bring safe water and adequate sanitation to all by 1990 at an estimated US\$300 billion (CA\$390 billion) — even using low-cost technologies and community self-help. It is clear that governments and aid agencies alone will not be able to support the bill.

If any significant headway is to be made, it must be achieved through the efforts of the rural people themselves. This means that serious thought must be given to developing pumping devices that can withstand the use — and abuse — of large user groups. It means pumps that can be purchased, installed, and maintained locally. Even more important, it means pumps must be manufactured in-country using available materials, thus reducing reliance on imports. Governments must develop strategies to promote community acceptance and self-reliance at the village level. Programs for the effective transfer of the technology

to the villagers themselves must be developed and implemented.

One of the most important problems in rural water supply programs is the high failure rate of conventional manual pumps. Failures occur mainly because pumps were not designed for the level of stress and abuse they routinely receive in the rural areas of developing countries. Because the materials from which conventional pumps are made — mainly cast-iron and steel — are not only expensive, but are not readily available locally, many developing countries must rely on imported pumps and parts supplied by international and bilateral donors. This presents difficulties in terms of costs, and maintenance requirements, and problems in procurement of spare parts.



*(Opposite) A simple, village-level operated and maintained water pump — such as this one in Malaysia — can bring safe water within the reach of many rural people. (Above) A long trek for a few buckets of muddy water from an unprotected well in northeast Thailand: for many, disease comes with the water*

Since 1976, IDRC has been supporting research on the development of more effective pumping systems for rural water supplies. The approach taken has been to examine systematically the implications of new materials and improved pump designs. In view of the widespread introduction of plastics technology that has taken place in developing countries in the last decade, particular attention was focused on the polymer resins, specifically polyvinylchloride (PVC) and polyethylene (PE). Both materials are widely available throughout Africa and Asia. In many respects, plastics technology is to developing countries what cast-iron was to industrialized countries many years ago. The vast potential of plastics for use in handpump components has only recently been explored.

The IDRC-sponsored design work centered on developing a simple, low-cost PVC piston and foot valve assembly for a manual, shallow-well pump. These below-ground components — the piston and foot valve — were designed to be interchangeable, thus saving labour costs in manufacture, simplifying maintenance procedures, and keeping the required number of parts to a minimum.

Early development research was carried out by a Canadian University, the University of Waterloo, and was completed in April 1978. The prototype pump assembly was then tested at the Consumer's Association Testing Facility in England as part of a project sponsored by Britain's Overseas Development Ministry. The tests established the reliability and efficiency of the Waterloo design compared with the technology of the time. The Waterloo pump differed from others in the testing program in that it was designed specifically for manufacture in developing countries, utilizing existing, locally available resources.

The next stage, later in 1978, was to support research groups in several African and Asian countries to field-test the pump. Trials were undertaken in Malaysia, the Philippines, Sri Lanka, and Thailand in Asia, and Ethiopia and Malawi in Africa. The primary objectives of these research projects were to assess the Waterloo design in varying environmental conditions. The research was to determine the appropriateness of the pump for local manufacture and to estimate the cost of manufacture. Further, the research was to evaluate reliability and durability, maintenance requirements at the village level, and technical performance of the pump. IDRC's approach was to provide the researchers with a prototype, which the research team would reproduce and field test. As it turned out, the design was modified according to the availability of local materials and the results of further in-country laboratory tests. The above-ground components — spigots and pumpstands — were individually designed and locally produced. These modifications turned out to be an advantage, as they proved that a technology must first be adapted to local conditions before it can be successfully adopted.

In August 1980, a mid-project meeting for the four Asian projects was held at the University of Malaya, Kuala Lumpur, to review their progress and establish common field monitoring and measurement techniques. A unique method for accurately determining pump usage by means of a mechanical counting device, designed at the University of Malaya, was incorporated into the field testing program. This device made it possible to correlate measurements of wear with the distance the piston traveled, or the amount the pump was used, and made accurate field monitoring possible. This IDRC-sponsored field testing pro-



gram is believed to be the first of its kind.

The second round of IDRC-supported research includes projects in Malaysia, Sri Lanka, Thailand, Philippines, Ethiopia, Indonesia (under negotiation) and Costa Rica (under negotiation). Two research groups in India have also expressed interest in the PVC pumps. These new projects will examine ways of promoting community acceptance, financing and maintenance schemes, and various community-based manufacturing options. In addition, low-cost well-drilling techniques will be investigated. In conjunction with this network of projects, a special project on support materials for handpump installation and maintenance (a manual designed for illiterate and semiliterate villagers) is being developed.

As many international, national and private institutions and agencies (including IDRC) have embarked upon research and development programs to improve handpump designs, there

is now an urgent need to assess the present knowledge, situation and trends in regard to handpump technology, and review and document the changes that have taken place.

The IDRC approach has been to encourage local researchers to experiment with a basic design and adapt it to local conditions with the materials available to them. In this way we hope to promote the development of a true village-level operated and maintained (VLOM) pump. Rather than focusing on heavy-duty, medium and deep-well designs and large-scale centralized commercial production, our program has emphasized simplicity, low-cost and small-scale, decentralized manufacture. In addition, in keeping with the IDRC mandate, we are attempting to develop local expertise in all aspects of handpump technology, from experimentation to manufacture.

It must be remembered, however, that transferring a technology is not a simple case of financial resources, trained experts and a good design. It

also involves complex social, cultural, political, and economic considerations that are best — perhaps only — understood by the people themselves. Technology cannot be “parachuted in.” It must be examined, tested, and modified according to local needs, available expertise and materials.

Finally, it must be pointed out that the basic Waterloo design is no better or worse than any other design. It is one of many technical options. In some communities, a pump with PVC components may be the answer, in others it may only serve as an interim technology until something better can be afforded. In still other communities, it may not be suitable at all. However, for the many millions of the world's rural population, PVC handpump technology is a beginning, a contribution to the Decade target of clean water for all by 1990. □

*Donald S. Sharp is associate director, water supply and sanitation, of the Health Sciences Division of IDRC.*

## A QUICK FIX

Somewhat more than a million people in the Central Highlands of Malawi get their water from unprotected waterholes near lowlying dambos, where surface water collects from rain runoff. Cholera has been a severe problem, prompting Malawian health officials to give a high priority to protecting water supplies from contamination. An IDRC project testing the PVC handpump was part of the program.

Tom Nkana, project manager for the community protected wells program, stands in front of a large topographic wall map of the highlands tacked up at the program's workshop headquarters in Dowa. He points to the carefully drafted circles that mark off about 16 different regions, their radius the distance a technical assistant can cover by bicycle in a day. Some circles are studded with coloured pins representing, Mr Nkana explains, well sites at various stages of development. The villagers make 1000 bricks, dig and lay the foundation for a well with supplies and direction from the program. The program installs a concrete slab top and pump, and trains a member of a village-appointed well committee in operation and maintenance.

One pins marks Mayiloni, a family settlement in the Nambumba area that has had a well for about a year. Mayiloni at first appears to be not much more than the well, the centre of a latticework of paths weaving off into the low surrounding brush. But within ten minutes of the arrival of Mr Nkana and IDRC researcher Lindsey Robertson of the Ministry of

Community Development and Social Welfare on an inspection tour, a small crowd has gathered. One member of the village well committee, armed with a project-provided spanner and a large pipe wrench, quickly unfastens the pump-stand with a few practiced turns and eager hands pull the pump up for a look.

Malawi has been testing and developing pumps for its wells program for a number of years; this pump is something of a mutant, combining the cast-iron pumpstand, pump rod, and couplings of earlier versions with the PVC piston, valves, and casing of the latest designs. The piston and rings are still in good shape, although some scratching is apparent.

Robertson gives the sealing rings an experimental prod, checking for spring. “They seem to be holding up rather well,” he says. “We were expecting that the rings would lose elasticity — at least that was the laboratory finding. Actually, the rings don't seem to significantly improve efficiency. The interesting thing is that they take all the wear and can easily be replaced. And sand and foreign material just becomes embedded in the softer rings instead of wearing against the pipe wall.

“It's quite a different thing to test a pump in Waterloo, Canada, and to use it every day here in Malawi. One of our problems has been with hyenas chewing the tee fittings and spigots from our pumps. The white PVC we use looks like bone — a favourite with them. You can't really plan for that.”

What happens next seems to make his point even more convincing. The pump is checked and put back in

place, and the well committee man fills a bucket to be sure everything is in working order. The visitors are invited to pump a few courtesy strokes. When Robertson steps up to the pump, the water stops. Something has gone wrong. The committee man steps in with his helpers and unbolts the pump-stand again. The pump comes off the well, but this time no pipe is attached. The threads on the metal coupling joining the PVC casing to the pump have rusted out and been stripped. The casing separated and fell into the well.

A boy is sent running for some string, which is wrapped around the threads to pack the joint and make it secure. A few minutes later, water gushes once again from the spigot. The repair is temporary, but sufficient. The Mayiloni well is scheduled to receive an all-PVC pump within the near future.

It is obvious that the villagers take great pride in their well and in their ability to maintain it. The pump has not betrayed the effort they invested in building the well and learning new ways of using water. They can trust it to work, and if something should go wrong, it is not too difficult to set right again quickly.

The PVC pump has caught on in Malawi. The project headquarters had to be moved because enthusiastic adoption in the original area quickly “saturated” it with close to 100 installations. The Malawians have 500 experimental pumps. They are waiting for the research results to be incorporated into a final set of specifications, and then plan to manufacture and install the best version in the thousands.



# INSIDE THE PVC PUMP

Handpump technology has changed little since Ctesibius developed a water lifting device for fire fighting in Alexandria circa 275 BC. The most commonly used type for community water supply is a piston pump, in which a piston moving up and down inside a cylinder creates a partial vacuum, and atmospheric pressure on the groundwater outside the pump cylinder pushes water up through the pump. The principle is the same as drinking water through a straw. Valves can be used to seal the piston so that it lifts the column of water trapped above it, while drawing more water into the foot of the column below it. While the piston valve is open, the foot valve is shut — and vice versa — in a reciprocal manner.

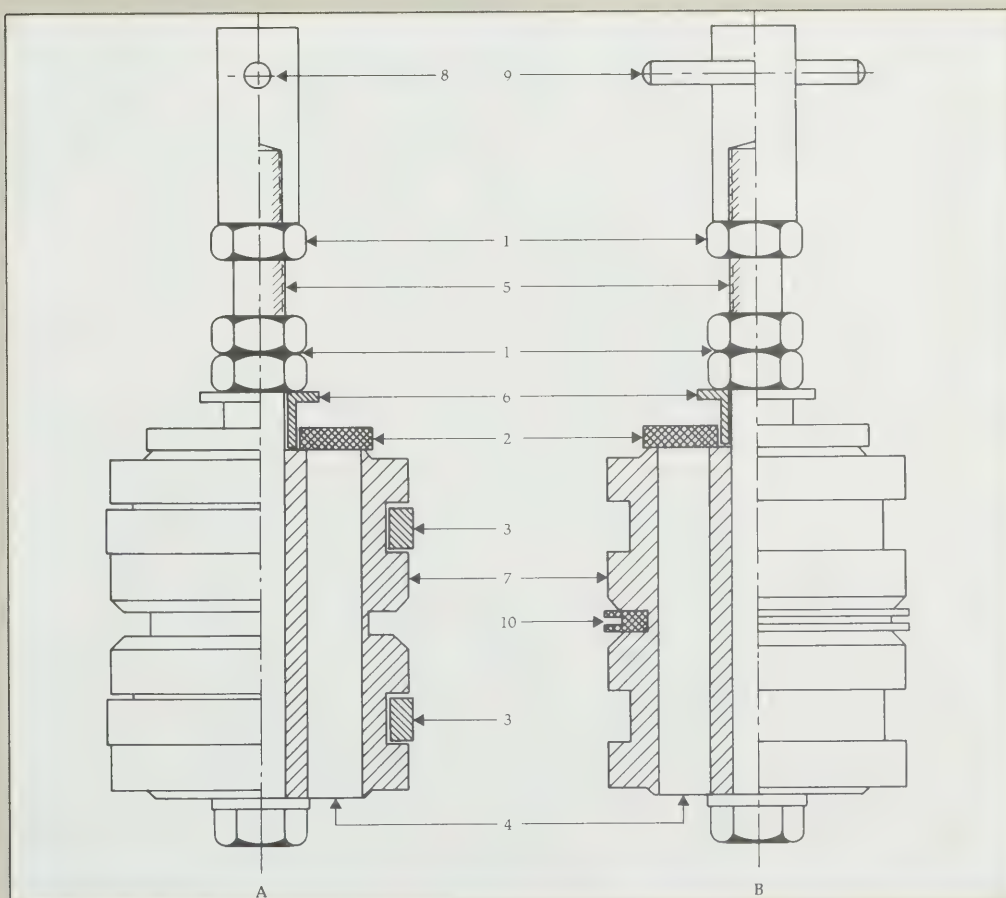
**B**y the 1850s iron-bodied hand-operated reciprocating pumps were mass produced from standard designs — and opened new frontiers for agricultural development and settlements. But mechanization and electrification overtook the handpump, its market shrank, and interest in its development turned elsewhere. The handpump stopped evolving almost 50 years ago.

International assistance programs for rural water supplies created a new demand for rugged, low-cost pumps designed for simple troublefree operation and maintenance by local technicians. Experience taught some hard lessons: handpumps as

they existed were not adapted for use in developing country villages, where they might be in use continually for up to 18 hours a day, worked by many different hands at different rates — and never get a drop of oil or have a nut tightened.

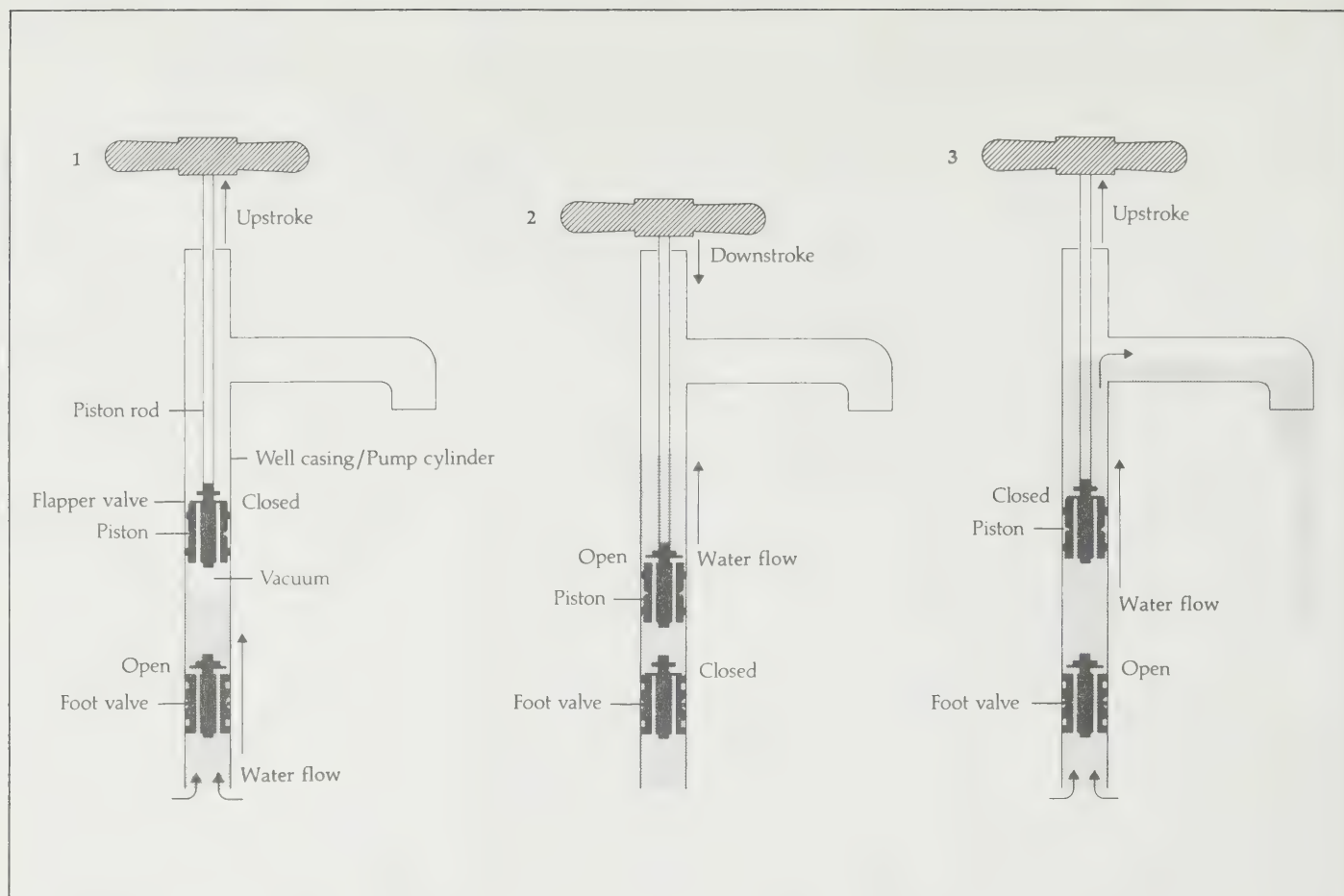
In many countries the most common cause of pump breakdown was wear of the seals that prevent water already raised from slipping between the piston and the cylinder walls during pumping. Success with an improved seal made from polyvinyl-chloride (PVC) plastic led to investigations of the other uses this material might have for pumps.

The search eventually led to a novel



(A) Piston assembly and (B) recoverable foot valve: (1) lock nuts; (2) valve flap (natural rubber); (3) piston rings (polyethylene); (4) six equally spaced holes; (5) bolt; (6) valve stop; (7) PVC plastic; (8) hole for connecting pin; (9) recovery pin; and (10) double-lip rubber seal





design that simplified the pumps mechanically, and substituted plastic pipe and moulded or milled plastic components for the traditional cast-iron or steel. The result is a lightweight but hardy pump that is easy to transport and install, requires minimal upkeep — and is inexpensive. Because many developing countries already produce PVC pipe for domestic use, the cost is reduced substantially.

A single PVC pipe serves as the well casing and pump cylinder. Inside, smaller diameter pipe serves as the piston rod, driving a moulded or milled plastic piston. A check or foot valve at the bottom of the casing pipe keeps the water from escaping on the pumping downstroke. Both the piston and the foot valve are made of the same interchangeable components: perforated plastic discs with flapper valves covering the holes. This design, with one simple alteration, can be applied to two different methods of water retrieval. Where the water table is relatively close to the surface, above 8 metres, the piston and foot-valve assembly can be installed in the pump body and through suction it can draw water upwards.

Where the water table is lower, the piston and foot-valve assembly can be installed below ground within the casing pipe. From this position it is possible to "lift" the water up through the pump. These two variations are termed "suction" and "lift," respectively.

The simplified diagram on page 7 illustrates the action of the pump. On the upstroke, the flapper valve on top

of the piston is in the closed position, thereby allowing a partial vacuum to be created in the cylinder below the piston. Water from the well enters the cylinder through the bottom, forces open the flapper on top of the foot valve, and rushes into the space between the piston and foot valve to fill the vacuum (Fig. 1). On the downstroke, the increase in pressure forces open the flapper valve on top of the piston, allowing the air, followed by water, to flow up through the uncovered holes in the piston (Fig. 2). On the next upstroke, the weight of the water causes the flapper valve on the piston to shut, trapping the water above the piston and forcing it up the cylinder (or riser pipe) as more water flows up into the cylinder through the open foot valve (Fig. 3). With each motion of the piston, the water is raised to a higher level, and comes out the spout when the cylinder becomes full.

The mechanical process is the same in the "lift" type pump, but since the piston assembly is already in contact with the water, it is simply a matter of lifting a column of water standing on the piston.

The problem of leaking seals has been attacked by installing rings on the piston (akin to those that are found on automobile engines) that are forced against the cylinder wall to make a seal by the pressure of a small flow of water channelled behind them as the piston moves.

Deformities in locally produced PVC pipe, and the obstructions of joints in the longer lengths needed to reach

water in Ethiopia, forced engineers there to abandon the rings. But they discovered that grooves in the piston where the rings might have gone created a pressure drop in water flowing past them. The drop slowed and blocked the flow between the piston and cylinder wall, in effect creating a water seal that naturally conformed to the irregularities in the pipe. In Sri Lanka, leather cup seals were used to overcome the same problem of pipe irregularities.

A second important failing of traditional pumps — breakage of the handles and their fulcrums from the stresses put on them by hard use — was solved by eliminating the lever handle in favour of a crosspiece grip like a bicycle handlebar attached directly to the pump rod. Pumping is simply a straight up-and-down lifting and pushing motion. It seems well adapted to developing countries, where women will pump with a vigorous motion like pounding grain in a mortar, and small children will grab either side of the handlebar and jump up and down helping one another.

Although it coped with many of the problems plaguing older designs, the PVC pump had to prove all its promise in actual use before engineers or villagers, wary of the latest technological fix, would accept it. IDRC embarked on an intensive global trial of the PVC pump, involving laboratory and field studies in Canada, England, Malaysia, Ethiopia, the Philippines, Sri Lanka, Thailand, and Malawi. □



# AN APPROPRIATED TECHNOLOGY

## HANDPUMPS IN SRI LANKA

MARK ROGERS

**T**he new handpumps in the village of Yatiyana in Sri Lanka brought more than clean water to the families living nearby. For years villagers had been getting their drinking water from a shallow pit that they shared with dogs, snakes, and vermin. The result was diarrhea and dysentery.

The fresh, clean water the new pumps have provided has changed this depressing picture. One of the major sources of water-borne disease has been eliminated. But solving the health problems of Sri Lanka is no easy task. There are 23 000 villages in the coun-

try. A pump that is cheap and easy to maintain is essential to success.

Coinciding with the United Nations International Water Supply and Sanitation Decade, the Sri Lankan government, with the help of development organizations such as UNICEF, has launched a program to bring clean water to rural areas. The government has allotted 8 percent of its budget for this purpose.

In the rural areas only 13 percent of the population has access to community water supplies. The majority of Sri Lankans still get their water from

rivers, lakes, canals, or open wells. Many do not understand the need to boil water.

Plans call for 2500 wells to be constructed and supplied with handpumps, 130 towns to receive piped water, and the water supply system of 60 villages to be repaired and upgraded. The government has estimated that 4000 handpumps will be needed each year from 1985 onwards.

Handpumps became the focus of attention in Sri Lanka in 1978 when the government decided to investigate whether a pump could be manufactured that would not be too sophisticated for villagers to take care of themselves. Until then, pumps required a central maintenance service to keep them functioning.

The government also wanted to solve the problem of communication with the villagers. Installing the handpumps would have little impact on health if they could not convince the villagers to stop using alternate sources of water. The government turned to the Lanka Jathika Sarvodaya Shramadana Sangamaya (Sarvodaya movement) to take on the job.

The movement was founded in Sri Lanka by a 27-year-old high school teacher from Colombo, Agangame Tudor Ariyaratne, in 1958. He was inspired by the Sarvodaya ("all-awakening" or consciousness raising) thought of Mahatma Gandhi and by Buddhist philosophy to create a model for village development work based on self-realization through service to others. Sarvodaya encourages voluntary sharing of labour by community members to achieve development through practical projects.

Sarvodaya's goal was to introduce 21 handpumps to seven villages, including Yatiyana, in the wet zone along Sri Lanka's southwest coast. The pumps were to meet three conditions: that they be made of inexpensive parts mainly available in Sri Lanka; that they be simple to repair; and that some plastic parts be used to avoid corrosion. Until then, several attempts had been made to design, build and install such pumps, but without success.

The handpump piston and cylinder developed by IDRC and the University of Waterloo in Canada were chosen for field testing and adaptation in a project supported by IDRC.

Sarvodaya explained to the people



*Researchers in Sri Lanka took a good design and made it better-adapted*



of Yatiyana and the other villages the importance of a covered well to their health and economy. Sarvodaya workers told them of the movement's philosophy of having everyone participate in both the labour and organization of a project. They encouraged a cooperative spirit by bringing the people together in work-sharing camps (*shramadanas*) and in gatherings where everyone was treated as part of a large family, making plans or putting on a cultural show. By working together, the villagers were awakened to a philosophy that would help them improve their economy in a way appropriate to their needs.

The Sarvodaya workshop had been building welded steel handpump stands and levers. These were redesigned to incorporate the IDRC/Waterloo piston and valve configuration. A local polyvinylchloride (PVC) manufacturer made pistons and valves. Polyethylene rings and other non-PVC components were machined at the Sarvodaya workshop, and some simple parts were made in the villages.

The villagers and field workers themselves selected the sites where each pump would be used by 3 to 10 families. No more than five pumps were installed in one village.

All wells were built according to a standard drawing, with walls constructed from rubble masonry and the cover and apron from reinforced concrete. In some sites there were existing wells constructed in this way, while in others Sarvodaya followers dug new ones.

By January 1980, the wells were built. In another five months, the handpumps were installed and monitoring work began. The work ended in April 1982.

Sarvodaya found it was able to come very close to reaching the goals for the design of the pump. Most parts were obtained in Sri Lanka. Only brass nuts and bolts, and polyethylene for piston rings, had to be imported. Plastic parts meant there was little corrosion.

Most pumps required some repairs, but these were not difficult to do, and in many cases could be undertaken by the villagers themselves. The pump technicians, who had been trained to assist with the installation of the pump, continued to make repairs when the pumps broke down or required parts from outside the village.

As a result of field testing, some changes were made in the IDRC/Waterloo design. Local fabrication of the piston and check valve caused considerable difficulty because solid PVC stock is not available in Sri Lanka. Several attempts were made to improvise with locally available materials. Initially, the Sarvodaya team tried making a "solid" rod or cylinder by gluing progressively smaller PVC pipes inside one another. Problems were encountered with this design because, when grooves were cut for the piston rings, the ends tended to break off. It was also very difficult to drill holes along the length of this "built-up" pipe. Next, researchers tried to fabricate the

piston and check valve from wood and still use polyethylene rings as a seal. Although the construction of the valves was easier, they were not successful because the piston rings stuck in the grooves and did not seal properly against the wall of the riser pipe. Also, a poor seal resulted because of the rough inside surface of the PVC pipes available in Sri Lanka. This rough surface also quickly wore the polyethylene rings, resulting in burrs on the edge of the rings, which contributed to their sticking in the grooves.

Because of these problems, it was impossible to obtain an adequate seal along the piston and check valve using PVC rings. Instead, leather cups that could be made in the villages were designed to solve this problem. These cups were made using a simple press and a locally fabricated die. The leather was treated with tallow and held in the press for about 30 minutes to acquire the required shape.

Using a design that combined a hollow PVC pipe with a wooden core and employed leather cup seals, the researchers completely solved the problem. Not only was the leakage stopped but the wear of the riser pipe was also lessened. When polyethylene rings were used during field testing, the riser pipe wore by 0.35 mm after 90 days of use. This is believed to be due to silt particles becoming embedded in the rings and acting like sandpaper against the cylinder wall. Similar tests with leather cups produced much less wear.

This wood and leather design makes local fabrication and repair possible, and has proven its reliability under field conditions. The use of leather instead of polyethylene rings meant

the rings wore out sooner, but it also meant that villagers, who could readily obtain leather and could work it, were able to replace the rings by themselves. Also, leather is less expensive than polyethylene.

In a second phase of the research, recently begun, the Sarvodaya group will manufacture their version of the pump through a network of cottage industries operated at the village level entirely by women. This research will test the feasibility of involving primary users — women — in all aspects of handpump development, from manufacture to installation and maintenance. By promoting handpump manufacture as an income-generating activity, it is hoped that self-sustaining village-level industries can be established. It is also anticipated that by locating the industries as close as possible to the sites where the pumps will be installed any problems in pump operation can be resolved easily. Spare parts and technical expertise will be readily accessible — not always the case when manufacture takes place at large-scale centralized facilities.

The PVC handpump was introduced to Sri Lanka as an exotic — but potentially adaptable — technology. The Sarvodaya team has in some senses reinvented the pump and thoroughly domesticated it. The pump is now moving out of the hands of the technicians and into the hands of people — an appropriated technology of the kind most likely to bring clear water to all who need it. □

*Mark Rogers is a Canadian freelance journalist. He visited the Sri Lankan handpumps project to prepare this story.*



*The handpump at Yatiyana: more than clean water* Photo: Mark Rogers



# A PUMP FOR ALL PEOPLE

## RELIABILITY OF SIMPLE, PLASTIC HANDPUMP IMPRESSES MALAYSIAN VILLAGERS

GOH SING YAU and LOW KWAI SIM

**H**andpumps made from polyvinylchloride (PVC) may provide one of the simplest and most practical ways of supplying safe, clean water to rural developing countries. But much of the pumps' potential benefits depends on the willingness of people to accept and use them.

In Malaysia, field tests of PVC pumps proved that they were technically feasible. To determine whether they were humanly feasible, researchers from the University of Malaya went to the Kuala Pilah district of Malaysia to determine the attitudes toward and the acceptability of the handpumps, as part of a 3-year IDRC-supported project to introduce and test the pumps.

More than 800 000 households in Malaysia still rely on traditional sources of water — sources that are often highly polluted and unsuitable for drinking. The government of Malaysia hopes to eventually supply piped water to the country's 13 million people — a task that may take a couple of decades to achieve. Currently, less than half the rural households have piped water. Handpumps can be an intermediate step, making safe water more accessible.

Kuala Pilah district is typical of much of Malaysia: 237 households scattered through traditional agricultural villages populated mainly by paddy farmers. About one-third of those households receive potable water through a pipe system, a slightly larger portion (approximately 40 percent) use some form of handpump. Of the remaining households (24 percent), half share wells, and the other half rely on open ponds or rivers as sources of water.

Researchers interviewed a cross-section of families. Some had used the University of Malaya PVC pump, some had used other types of pumps, some had used both PVC and metal pumps, and finally others had no pumps at all. The families were questioned about their experiences with pumps and water supplies.

Overall, the users were pleased with the handpumps. With the exception of



*PVC village pump: the benefits depend upon the people*

a single prolonged dry spell, they felt the water supply was consistent. This reliability was particularly pleasing to some villagers, because in areas serviced by pipes the water supply had been cut off during the rainy season.

The PVC handpumps also proved to be more convenient. Because the pumps were installed close to their homes, the villagers saved a great deal of time and effort in not having to fetch water from the river — a fair distance away. The plastic pumps were also lighter and easier to operate than were the metal pumps — a boon for women and children especially.

The better quality water from the PVC pumps also increased the acceptability and satisfaction. Water from PVC pumps was preferred over that from metal handpumps because it was free of rust. The colour was often described as "pure" instead of "yellow." It was also preferred to piped water because piped water contained levels of chlorine the families found hard to tolerate. Piped water was also said to be turbid and foul-smelling. Traditional sources of water, such as rivers and streams, were often reported as highly polluted and suitable only for washing and bathing.

The only complaints came in regards to the low volume of water from the tubewells. Although the handpumps supplied three or four houses daily with adequate water for drinking and cooking, there was often insufficient water for festive occasions and for repetitive functions such as bathing, laundering, and cleaning. Many users believed this may have been because the tubewells were just not deep enough to tap the groundwater, and they suggested alternative well locations. Other users blamed the shortage on the large number of households sharing each pump, and they asked that more pumps be installed.

Although the test pumps were installed free of charge, the villagers generally agreed that even if they had to pay for a PVC pump themselves, in the long- and short-term, it would still cost less than piped water supplied by the government. (For piped water, the installation price alone would be about double the price of a PVC pump.)

All the villagers agreed they were willing to work out a maintenance schedule both at the community and household levels so they would not have to rely on the Ministry of Health or university personnel to carry out repairs. Moreover, many of the male users showed a keen interest in learning more about the installation and maintenance of the pumps.

Despite the obvious satisfaction and acceptance of the PVC pumps, the villagers seemed reluctant to purchase the handpumps. Many claimed they were just too expensive. In many cases the financial barrier may be a real one, but for others, the unwillingness to pay may have been based on a misconception during the pilot testing. The free installation of pumps may have given some villagers the impression that the pumps are a deserved social benefit, requiring nothing in return.

Local mass-production may be able to make the handpumps more affordable. Research is currently underway to find a way to mass produce them by injection moulding of plastics. The Malaysian government will support the manufacture of 550 mass-produced models by a local plastic manufacturer. The pumps will be installed by the Ministry of Health and experiments will also be done on their performance in medium and deep wells. And once again, studies on social, cultural and economic acceptance will be launched to establish the proper way of passing the technological responsibility on to the Malaysian villagers. □

*Both authors are faculty members of the University of Malaya. Dr Goh is professor of Mechanical Engineering and Dr Low is Associate Professor of Hydrology in the Department of Geography. They recently conducted a preliminary study to determine the acceptability among villagers of a PVC handpump developed by Dr Goh and his colleagues.*



**W**ar and refugees are two sides of the same coin. Nowhere is this more evident than in Indochina where the tragedy of crowded refugee camps has persisted for decades. Sadly, war will likely continue to be an instrument for resolving or intensifying the ideological and racial conflicts of the region for many years to come.

For most of those uprooted by the wars and political strife, the future is uncertain. Many Indochinese refugees will eventually return to their homelands and reintegrate into their communities. For the refugees, education in their own language, using a curriculum drawn from their own culture, is a way of maintaining links with their home countries. And if refugees are to be accepted back into home countries where the political climate has changed, or war has decimated already meagre resources, they must not be perceived as posing additional problems or economic burdens. Education then is a sort of reformation of refugees, a passport back to home.

In the 1940s, when Vietnam was fighting for independence from the French, some 40 000 Vietnamese refugees crossed Laos into Thailand. Most of them and their children still live there. Many dream of returning home, but the Vietnamese government has never expressed any intention to take them back despite the Rangoon Agreement reached by Thailand and Vietnam on this old problem.

During the Vietnam-American war from 1955-1975, hundreds of thousands of the Vietnamese fled Southern Vietnam into Cambodia (now officially Democratic Kampuchea). And when former U.S. president Richard Nixon expanded the military theatre into Cambodia in 1970, these refugees were forced to return home. At the same time, the American bombing of Cambodia forced almost three million Khmers to leave their farms to take refuge in Phnom Penh and other towns. In April 1975, when the ultraradical Khmer Rouge seized power, they forced all the refugees and urban people back into the rice fields, where they

faced starvation, random execution and the danger of unexploded bombs. It is estimated that at least three million Khmers perished in the Cambodia war and the postwar Khmer Rouge "revolution."

#### CURRENT WAVES OF REFUGEES

Since the Communist victory in 1975, some 1.6 million people have left Vietnam, Cambodia and Laos. This figure accounts for only those who survived the journey. Many others died trying to flee concentration camps in Cambodia or were attacked and killed by pirates on the high seas.

From 1975-1978, hundreds of thousands of Cambodians fled the Khmer Rouge into Vietnam and Laos, while over 260 000 Vietnamese of Chinese ethnic origin fled Vietnam into mainland China. Some 1.2 million refugees from Indochina arrived in noncommunist countries in the region, stretching from Hong Kong to Thailand, Malaysia, Singapore, the Philippines, and Indonesia.

In 1979, when the Khmer Rouge were overthrown by the Vietnamese, some 500 000 Khmers concentrated along the Thai-Cambodian border. One group came independently; another was moved at gunpoint by the Khmer Rouge. Thousands of people died of starvation during these unplanned migrations. During this crisis alone, some 20 refugee camps were established both inside Thailand and along its borders.

Because the refugees arrived by the hundreds of thousands, it was impossible to build durable housing for them. They were therefore provided with bamboo and thatch to construct their own houses. Schools, hospitals, workshops, cultural centres, and other social and public facilities were also

built by the refugees. Bamboo cities, many of them cleaner and more pleasant to live in than the slums of Bangkok, sprang up in just a few days. Khao I Dang, a Khmer camp located about 300 kilometres east of Bangkok, is the world's largest bamboo city, while Ban Vinai, a camp located on the hills near the Mekong River in Loei Province, is the largest community of Hmongs (hilltribes). The majority of the refugees are from rural areas, and for many this is the first time they have lived in such a large urban-like community.

Self-ruled administrative structures were also set up to ensure smooth living in the camps. Thai authorities have provided security services, and the United Nations High Commission for

## BOOKS FOR THE BAMBOO CITIES

CURRICULUM DEVELOPMENT FOR INDOCHINA'S REFUGEES

SUPOTE PRASERTSRI

Refugees (UNHCR) and voluntary agencies have given material assistance. Refugees themselves operate and maintain the camps. By and large, they are being provided with all the basic needs — except freedom to earn a living outside the camps.

#### CHILDREN'S EXPERIENCES OF TERROR

Among the refugees of Indochina, the Khmer children have suffered most. Many of them have no parents or close relatives. These unaccompanied minors have many grim stories to tell — stories of starvation, torture and executions. Twelve-year-old Huot Sambo described what happened to his family: "My



Hilltribe refugee camp of Ban Nam Yao, northern Thailand: the bamboo city

Photo: Supote Prasertsri



parents were gold merchants and were accused of being rich. All of us were evacuated to the mountains where we had almost nothing to eat or drink. We ate roots and leaves to keep alive. First my parents died. Then my eldest sister died. Then my two younger brothers died. I buried them all myself...

When asked to participate in a drawing contest, most of the Khmer children reflected their nightmare in the labour camps, the war between the Khmer Rouge and the Vietnamese, the destruction of Buddhist temples by the Khmer Rouge, and other stories of terror. The Hmong children, on the contrary, like to draw pictures of green mountains, streams, birds and other animals, reflecting more peaceful experiences.

Many Khmer children said that they had not been allowed to play, sing a song, or enjoy children's activities. Expression of love and sorrow was strictly forbidden. Recounts a Khmer girl, "One old man taught me how to play tro (Khmer violin-type instrument) in the labour camp. The Khmer Rouge found out and killed him immediately."

FROM BASIC NEEDS TO BASIC EDUCATION

Once basic needs were met in the refugee camps, efforts to introduce education and culture began. The educational backgrounds of refugees vary from one ethnic group to another, with literacy rates of approximately 85 percent for the Vietnamese, 55 percent for the Khmers, 25 percent for the Laotians, and 6 percent for the hilltribes. Cambodia was the only country to experience a sharp decline in the literacy rate due to the deliberate policy of the Khmer Rouge to eliminate the educated class. Many of the Khmer children have not attended school in the past nine years.

In the beginning, the major problem was the lack of basic textbooks. The highest and most urgent priority, then, was to mobilize former teachers and other interested resource people to write textbooks for languages, mathematics, sciences and other socially useful subjects.

Simultaneously, efforts were made to search for textbooks among the refugees themselves, inside the countries of origin, and in many language institutions and universities in the United States, France, Japan and among international organizations (such as Unesco) in which Cambodia, Laos and Vietnam used to be active members. Some new books were also obtained from Laos and Kampuchea, but because these contained strong political "biases," they were rejected by refugee teachers and by the Thai Government, which did not want to be accused of promoting communist

ideology. A small number of old textbooks were also found, but they were out of date by present curriculum standards. They were accepted for temporary use only and will be discarded once new books have been developed.

For the largely illiterate hilltribes, educational programs had to be started from scratch because these refugees had never used books. Refugee educators expressed strong interest in contributing to their people and culture through the improvement or production of new learning materials.

The first curriculum development committee was organized in the Khmer camp of Khao I Dang in 1979. In 1981, with support from IDRC provided through a Thai voluntary agency, similar efforts began in hilltribe and Laotian camps. Up to the end of 1982, 62 textbooks and a number of supplementary reading materials were developed and some 230 titles of old books were reprinted for public and/or school use. A popular book entitled *Where there is no doctor* has been translated into Khmer for the first time by refugee doc-

Rouge came to power, my mother took me to Southern Laos and left only my youngest sister with my grandfather there in Cambodia. In Laos I attended secondary school where I developed skills in the ancient Khmer and Lao arts. I am now doing most of the drawing for this education committee.

"In Laos our families worked in the rice field just like other Laotian farmers. Unfortunately, a few years later my mother died of sickness. So I assumed the responsibility as the head of the family.

"In 1979, when I heard that the Khmer Rouge had been overthrown, I rushed back to Cambodia to look for my sister. I saw her there but I couldn't stay because the Vietnamese soldiers suspected me of being a spy for the Khmer Rouge. So I fled back to Laos. But I couldn't stay there either because the Laotian Government was recruiting young men to help the Vietnamese fight the war in Cambodia. So I fled to Thailand. I miss both Laos and Cambodia and want to liberate both of them because I belong to both. That's the reason why I never apply for resettlement in other countries."

Besides doing artwork, Sai Thong has also been responsible for reading reference materials in the Thai and Khmer languages and translating them for his Laotian colleagues. By the end of 1982 the books produced by Sai Thong and his team were printed and put into use in the camps. This brought great excitement and pride not only to the writers but to the whole camp community. At a later stage, even school children took part in the writing of children's story books.

THE PROCESS

The same kind of writing work caught the attention of the hilltribe refugees, particularly the Hmong, whose language was recently put into Romanized script. Writing books is a new skill for them. Their main problem is the lack of technical terms for science and mathematics, a need that can be met only in the long term.

The Mien (Yao) are still in the process of standardizing their Romanized script. The other smaller, but more ancient tribal groups — such as the Htin, the Lahu, and the Khamu — are being exposed to academic education for the first time. It will be many years before they can develop their own writing system.

Although none of the curriculum team members from the three ethnic groups had writing experience, the needs of camp life stimulated them to learn, practice and put ideas into action simultaneously. Their approach has important benefits. Because those who write the textbooks are also the teachers who use them, the gap be-



Art textbook for primary school: preserving traditions

tors in Khao I Dang camp. The refugees themselves were trained to write, print and bind books in the camps. As most of the early writers and artists eventually left for resettlement, efforts were also made to train others to take over the work. Resource persons within the camps and those identified in Thai colleges, including an education advisor from Unesco, were also involved in the year-round training program.

LIFE OF A WRITER-ARTIST

Most of the textbook writers are former teachers, but some are young people who had only primary or secondary education. One of them is Mr Sai Thong, aged 23, who was a refugee in Laos before coming to Thailand.

"I was born and spent my childhood years in Northern Cambodia," says Sai Thong. "In 1973, when American aircraft were heavily bombing Cambodia, I lived with the whole family. But one day, as my father was gathering wood in the forest he was killed by an unexploded bomb. In 1975, when the Khmer



tween theory and practice is reduced. The draft materials are tried out in camp schools chapter by chapter. The feedback allows for immediate improvement of the manuscripts.

As the work teams are independent, and revise and approve their own materials, the work is carried out more quickly and smoothly than in a traditional "top down" system of curriculum development. A large team in one Khmer camp has been able to complete primary school textbooks at an average rate of one title per month. Supplementary books are completed more rapidly because they require no technical inputs.

The main problem, according to the writers, is that they are not allowed to insert political thinking and issues into the texts. Such content cannot be printed and promoted by UNHCR, which is responsible for providing direct assistance to refugees. However, there are some advantages to this. Because of their neutrality, the books can be used not only in camps, but along the border areas as well.

The materials are designed by curriculum groups organized for each of a number of educational programs established in the camps: preschool, primary school, adult literacy, special education for the handicapped, skills training and, in some Khmer camps, secondary education. Some sign language manuals for the deaf were also developed and printed for use in the Khmer camps in 1982.

For the textbook development work, interested persons are recruited and organized into small groups, each specializing in a different subject — normally math, sciences, language, music and arts, health and nutrition, and supplementary readings. Each group studies sample and reference materials available in English, Thai, French, Khmer, and Lao and prepares an outline. The draft manuscripts are

then written and reviewed, and artists draw and review the illustrations. Next, the draft copies are reproduced for testing in camp schools. Feedback from teachers, pupils, and outside experts is also obtained and used as the basis for improvement. Lastly, the final manuscript is produced and sent to the printer in Bangkok for mass production. Small print jobs can be handled within the camps.

As for the supplementary readings, the whole community, including children, is normally invited to write short stories, poems, etc. Small awards are given to the best writers.

The children have demonstrated an ability to learn several languages simultaneously. This is not surprising, given that most come from ethnic groups with strong multilingual oral traditions. In the Hmong camp of Ban Vinai, primary school pupils are taught in Hmong, Lao, Thai and English. They have to learn many languages because they have an uncertain future — they may stay in Thailand, return home, or resettle in another country.

The new textbooks have greatly increased teacher effectiveness and student motivation. However, in hill-tribe camps it was observed that twice as many boys attended school as girls. To motivate young girls, some women were recruited as teachers, something that had never been done before in hilltribe camps. Activities such as embroidery were also included in the curriculum.

In the past seven years of camp life almost 100 percent of school-age refugees have enrolled in their camp school and large numbers of illiterate adults have also been taught basic reading and writing. Handicapped children enjoy equal access to education and thousands of adults have been equipped with occupational skills relevant to their needs.

For the hilltribes, ironically, the

opportunity to receive an education would likely have remained outside their reach had they not come to live in the refugee camps. At present, many of the hilltribe adults communicate with their relatives in the West by writing letters instead of using cassette tapes as they used to.

## FUTURE PROSPECTS

In all three ethnic groups — Lao, Khmer, and hilltribes — the work on curriculum development is continuing but on a smaller scale and at a slower pace. Material and technical support are lacking and many skilled writers/artists have been lost to resettlement programs.

As the total number of refugees in Thailand steadily decreases, the program's activities are also declining. Materials for the handicapped and postprimary education, however, continue to be produced and improved, and similar efforts are being made in Khmer border camps.

It is believed that when peace returns to Cambodia, the curriculum developers and artists will have an opportunity to continue to play their role in a more creative and supportive way in their homeland. The same expectation prevails among the hilltribes and the Laotians. Unfortunately, the problems of Cambodia and Laos are directly related to the conflict of interest among the superpowers. The latter have caused the problems but none is willing to solve them. For Cambodia, it began as a war between colonizer (France) and colonized (Cambodia). Later it was a war between communists (China, Khmer Rouge) and capitalists (U.S.A.). Now it is a war between the communists themselves (China, Russia, Vietnam). In the end, it is the innocent Khmers who suffer.

Despite the difficulties, many Khmers and Laotians have voluntarily gone back home. Even many of those who resettled abroad have expressed an intention to return. However, every month new refugees arrive in Thailand, mainly to reunite with their families in the camps or abroad.

The Vietnamese refugees, on the other hand, have rarely expressed an interest in returning home. Their flow is one-way and will continue to be so for many decades to come. The Vietnamese Government has allowed an increase in direct emigration from the country through the UNHCR-sponsored Orderly Departure Program, but because of authorization problems, some 2000 refugees per month still escape by boat through pirate-infested waters. Since 1983, however, the overall rate of resettlement has fortunately exceeded the rate of arrival in the region, indicating good prospects for refugee movement. □

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Sai Thong (left) and colleagues working on books in Lao

Photo: Supote Prasertsri





# SURVIVAL TACTICS

## CENTRAL AMERICA: EVERYONE FOR HIMSELF AND POVERTY FOR ALL

DENIS MARCHETERRE

**I**n Central America, as anywhere else, you need money to live and to enjoy yourself. But in Central America, as anywhere else, some people do not even have the money to live, let alone enjoy themselves. The economic crisis of recent years has definitely done nothing to heal certain old social wounds. The result: once again, the people hit the hardest are those living on a low income, particularly in large urban centres. The outcome of this situation is what is known today as "marginalization."



Photo: Maria E. Esquivel

*Collecting papers and containers for resale: marginalized people work at what they can*



One mother in her fifties explained it in these terms: "Aunque lo quisieramos, no podemos señor." "We couldn't even if we wanted to." No longer able to spend a few hours dancing, go to the movies, or even have a simple meal in a local restaurant, this woman is not living. She is just surviving, cut off from the normal activities of others in a shantytown outside San José, the capital of Costa Rica.

There is such a proliferation of studies on the shantytowns of Central America that one more may seem a useless repetition. Yet we do not appear to understand fully how marginalized (or simply poor) populations survive in the face of the recent economic crisis affecting the region. Moreover, statistics cannot give an accurate picture of the situation. For this reason, IDRC has joined the Confederation Universitaria Centroamericana (CSUCA) and the Teaching and Research Program in Social Work of the Universidad nacional autónoma de Honduras to study the varying income structures of these families, their spending patterns and the factors influencing them, and to assess the role of community organizations. They also hope to provide public, private and community organizations with the most accurate description possible of the situation in order to improve programs and projects and adapt them to the needs and characteristics of the underprivileged. San José in Costa Rica and Tegucigalpa, Honduras are the capital cities chosen for this study.

San José is a city with two faces. Its relatively modern appearance deceives the eye. Street vendors, beggars, cripples, alcoholics, and people plying trades of every kind are part of the daily scene, but where these people come from is hidden. The shabbier sectors of the city are elsewhere, far from the eyes of the majority. Despite its handsome exterior, San José is adapting little to the social changes that are gathering momentum. Increased urbanization is leading to a whole series of transportation and pollution problems and a sad reduction in green spaces. In Tegucigalpa, on the other hand, poverty is everywhere. Erosion and humans have reduced the forests that surrounded the city 20 years ago to dusty, dry hills where newcomers have decided to set up their homes. Tegucigalpa is not a beautiful city. The only way to ignore the poverty is to be blind or unconscious. It is possible to live in Tegucigalpa, but it is harder to adapt to it. The capital's haphazard growth has caused problems in the past, and today it is battling with a critical shortage of essential services such as a sewer system and electricity. Water quality is also uncertain.



Children are "compelled to forsake their youth" to help earn a living  
Photo: Maria E. Esquivel

In San José and in Tegucigalpa, all the poorer sectors are not necessarily the same. The quality of life differs from one sector to another, depending on the facilities and existing conditions—for example, water, streets, electricity, sewers, dump sites, housing, violence, the crime rate, and so on. Even within the slums there are class struggles and rivalries. Some people, for instance, may have a two-storey or concrete house that they want to protect. Others may be struggling to find wood and cardboard to build a shelter. The inhabitants form a heterogeneous population. They are of all ages (although most are young) and all levels of education.

In today's economic crisis, the people living in Tegucigalpa's poorer sections come mainly from the country's rural regions. The shantytowns often serve as buffer zones between the rural areas and the urban centre. People move there not only to increase their sources of income or to benefit from essential services missing in the country, but sometimes to follow the whims of the market that dictate that corn, for example, shall cost less in the city than in the country.

San José is a separate case. Rural-urban migrations have given way to a type of intraurban movement so that people move from one section to another, mainly because the quality of life in the city has diminished considerably in recent years. They usually seek to avoid paying rent by owning their own homes instead. They also want to spend less on electricity, gas and water. Consequently, although most shantytowns are created by people squatting on the land, they often grow out from themselves, day after day receiving the latest victims of the breakdowns of urban life.

In both capital cities, vacant urban lots are not taken over just because of a lack of housing, but because of a lack of money to pay for a decent home. Construction costs are high and interest rates difficult to meet. Appropriation of government land has assumed such political importance in Honduras that the phenomenon is labelled "land

recovery," rather than squatting. For the squatters, public land is theirs by right. In Honduras, as in Costa Rica, a series of legal and moral battles have ensued between private owners, governments and squatters, all of whom are more or less prepared to negotiate according to the mood of the times. The whole problem they must tackle is one of subdivision, rents and "illegal" owners.

"Marginalized" people rarely have fixed incomes. Wage-earners usually work in traditional industries such as food production, wood-working, footwear, and textiles. The self-employed are

normally bakers, shoemakers, carpenters, tailors or small shopkeepers. Women, the majority with families, generally stay at home because they must care for children or they lack the training necessary to work outside. They cook for other people or do some craftwork. The children, compelled to forsake their youth, wash cars, shine shoes or become street vendors. Everyone works at all times of the day and, very often, every day.

Most people work at odd jobs or, as they say there, "camaronear." Men with carts pick up old newspapers and glass and plastic containers for resale, or carry stone and soil for gardens. As one of them put it, "When you have no training, you do whatever work others have for you." Other people also rent out empty rooms in their own homes as one way to increase their incomes. In Tegucigalpa, large houses in the inner city are rented out by the room to big families. More often than not, these houses hide miniature shantytowns behind their walls.

Living in this way, people have simple expenses: food, housing (water, electricity), clothing and transportation. Milk, eggs, meat, vegetables and fruit are treats for holidays. The alternatives are simple as well: bread, coffee, legumes, tubers, starches and basic grains.

## ORGANIZATION

Depending on the times, underprivileged sectors of the population can exert fairly strong pressure. As a result, they receive occasional aid according to the good will and resources of governments, municipalities, political parties, private organizations and the church. Often, they will wait for this aid rather than take responsibility themselves, because poverty is synonymous not only with a lack of money, but also with a set of attitudes born of a certain type of environment and education.

Many people have resigned themselves to their condition. They are so little inclined to plan for the future that their thoughts are fixed on the present. They live in an environment where psy-



chological disorders, male supremacy, authoritarianism, violence, and lack of privacy are the order of the day. Marginalization can sometimes kill off what little initiative people have left.

On the other hand, some aid programs, too paternalistic or poorly adapted to actual conditions, produce discontent and apathy rather than the "progress" sought by the planners. In 1983, a public social aid agency in Costa Rica established an entire neighbourhood of simple and practical houses intended for low-income residents of Chapulines, a San José neighbourhood with a bad reputation. The government had forgotten to provide along with these houses the infrastructures necessary to supply drinking water, remove wastewater and install electricity. Despite the comfort these homes represented to the people of Chapulines, many of them preferred to remove the doors, window frames and wood they needed to improve their own shacks, which were better equipped for essential services than the modern residential sector given to them by the government and which today is left abandoned.

This is why it is so difficult to be a leader in these communities. People rarely cooperate. They are used to studies, visitors and promises that bring no concrete results. Community organizations confront many obstacles before reaching their objectives: instability created by members constantly coming and going; irregular attendance by others because of their long working hours; anticommunist propaganda; the chronic lack of training and expertise within the organization, which leads to extemporization and corruption; and, in the case of Honduras especially, fear of police repression. You have to be patient to be a leader. You have to repeat the same explanations over and over and know how to attract people, who give more priority to their own survival (meaning seeking an income) and that of their families than to community struggles. In short, the things lacking are unity, awareness, and self-confidence, the three prerequisites for breaking out of the cycle of poverty.

The fight is made even more difficult by governments' tendency to invest in large-scale economic projects rather than in social programs. Policies on such social programs as do exist suffer from a lack of continuity. Resources are limited, of course, and the need is great, but so is the lack of understanding among many government employees.

There is some activity in the neglected sections of San José and Tegucigalpa, nonetheless. Nearly every neighbourhood in the capital of Honduras has its own development organization called the "Patronato." Its main purpose is to exert pressure on public authorities to obtain missing basic services. But the Patronato is also the source of festivities and recreational activities in the community.

Although permanent development organizations are firmly established in Costa Rica's urban communities, ad hoc committees for water, housing or education are the most frequently found. People band together and share duties according to the needs of the cause and the moment, but the group dissolves once the problem is solved.

Community organizations in both countries had their greatest impetus in the 1950s when unions, cooperatives and women's groups sprang up and flourished. As in the past, the local priest now finds himself in the role of initiator. He invites people to meetings, suggests ideas for projects and gives advice. Local media are active in some communities: neighbourhood newspapers, bulletins, pamphlets and so on. San José even has a radio station serving poorer areas on the south side. Radio America, a community station, provides a political forum and a flea market as well as entertainment for its listeners.

One fact that arises is that people seem more inclined (by habit or lack of various resources) to form groups to assert their rights, rather than set up organizations to create new sources of income, such as cooperatives. However, they do not want free aid. They want work and an income so they can solve their problems on their own. According to some people, "Instead of having reformist and utopian dreams, it is better to think of concrete ways to earn a living, get training . . . but maybe this means halting the system, having a revolution."

Revolution aside, developing small- and medium-size neighbourhood businesses is an idea that appeals to the region's planners and intellectuals. Such businesses can easily be geared to the characteristics of low-income groups and their method of working. In any case, there are few alternatives. Either nonagricultural employment is developed or everyone is sent back to the country to work on the farms. Setting up neighbourhood businesses seems the most plausible solution, but to do this, authorities must consider increasing access to sources of financing, training, and community work, and rethink certain laws. This is long-term work.

Meanwhile, the marginal people live in the city, adding what little meaning they can to their lives, even when they have the physical and mental capacities for "success." It is not by accident that the play "El Premio Flaco," "The Meagre Prize," a comedy by Cuban author Hector Quintero, ended with the line, "Para qué vivir, para qué!" "What's the use of living? What's the use?" The play is set in the hovels of a shantytown. During its long run in San José, as the audience poured out of the theatre laughing after the show, a lone man could be seen sweeping the street. This man probably never knew that the play was about him and his life. The audience, for the most part, never noticed the streetsweeper. He was not one of them. □

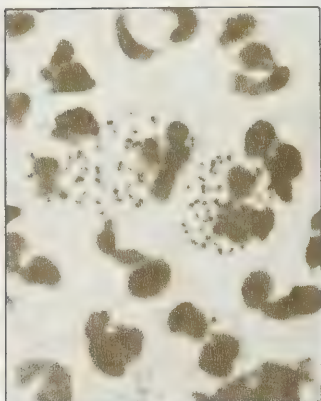
*Denis Marcheterre is a freelance journalist living in Costa Rica.*



Photo: Maria E. Esquivel

*The frustrations of living on the edge: housing protest in San José*





(Left) The microscopic appearance of *Neisseria gonorrhoeae* — gonorrhea — and its effects, a newborn with eye infection and a blind child

# EVERY SIX SECONDS

## SEXUALLY TRANSMITTED DISEASES ON THE INCREASE

JACQUES DUPONT

**W**ith prostitution becoming a matter of economic survival for a growing number of people in the Third World, with sexual contacts increasing, especially among young people, and with trips abroad for work, study, and so forth becoming longer and more frequent, an increase in sexually transmitted disease (STD) is inevitable. Every six seconds someone contracts an STD, according to Dr Richard Morisset, chairman of the International Conjoint STD Meeting, held in June this year in Montreal, Quebec (Canada). Under the patronage of WHO (World Health Organization), this meeting brought together approximately 1000 specialists from more than 50 countries. Several workshops dealt with STDs in the Third World.

The workshops revealed an urgent need for drug therapies and assistance for women and children in developing countries, as it is these groups who are most affected. A resolution to this effect had been adopted during the annual meeting of the general assembly of the International Union against Venereal Diseases and Treponematoses (IUVDT): the WHO was asked to take aggressive action in this area of health. The IUVDT resolution also made particular mention of fatal cases of AIDS (acquired immunodeficiency syndrome), the connection between cancer and venereal diseases, and the increases in the rates of mortality, infertility and neonatal infections resulting from chlamydia, a bacterial infection. The need to form a common front in order to review and improve diagnostic methods and various treatments was also emphasized.

Dr King Holmes, an STD researcher at the University of Washington in the

United States, claimed that "even though a reduction in the number of cases of sexually transmitted diseases is possible in the long run, the immediate future is rather bleak." The efforts of the medical world should be focused primarily on chlamydia, he said, a disease similar to gonorrhea but now believed to be much more widespread. It is now estimated that more than 500 million people throughout the world are currently afflicted with this disease, which is termed by many a genuine global epidemic. The resulting infections are said to be responsible for a significant proportion of cases of pelvic inflammatory disease (PID), an infection of the fallopian tubes, and of ectopic pregnancies (occurring outside the womb). Cases of chlamydia are still difficult to identify because the symptoms are quite similar to those of gonorrhea, or often unnoticeable. In fact, three out of every four women and a quarter of all men afflicted will not even have any symptoms. Studies conducted in the U.S.A. show that when the disease goes undiagnosed in pregnant women, their newborns risk contracting conjunctivitis (50 percent chance) and pneumonia (20 percent chance). The long-term effects of chlamydia on newborns are not known.

### WOMEN AND CHILDREN

Women and children suffer the most serious complications from STDs. According to Dr Morisset, half of all infertility in women is caused by such diseases. At the close of the meeting, he stated: "For the first time light has been shed on the magnitude of the complications resulting from STDs. We have ignored until now the extent of the

correlation between these diseases and acquired infertility, some high-risk pregnancies, and other complications."

There is no longer any doubt that cancer of the cervix is the result of a sexually transmitted disease, according to Dr Alex Ferenczy of the University of McGill in Montreal. "Although the exact causes of cancer of the cervix are still not known, it is clear that the more a woman has sexual contact with several partners, the more likely she is to have cervical cancer." There is also evidence to suggest that women who have never had sexual intercourse do not usually get cancer of the cervix.

Dr Ferenczy added that the problem was becoming more widespread. He suggested that the remarkable increase in genital warts in women was symptomatic of the new picture of STDs. Genital warts were one of the first sexually transmitted diseases ever to be described, affecting both males and females. A frequent occurrence in very sexually active people — 10 percent of prostitutes suffer from them — genital warts may, in some cases, lead to cancer of the cervix.

Dr Willard Cates from the Centre for Disease Control in Atlanta, Georgia (U.S.A.) appealed to governments, the WHO, and other international organizations to concentrate their efforts on pregnant women, if prevention and treatment programs for the entire population were not feasible at present. In the late 1970s in Sudan, the percentage of childless households fell from 10 to 6 percent after programs involving the treatment of STDs with penicillin were introduced. This demonstrates that sterility and high-risk pregnancies can be reduced, he stated.

In Kenya, a study at the Nairobi city



STD clinic by Professor L. Fransen shows that 40 percent of women who gave birth to a child with ophthalmia neonatorum (eye infection) had gonorrhea, and 21 percent had chlamydia. When it is not treated in time, this infection can lead to blindness in the affected children. A research project subsidized by IDRC at the University of Nairobi seeks to determine the incidence and etiology of ophthalmia neonatorum in a segment of the Kenyan population and to ascertain which methods of prevention and treatment are the most effective. The use of a silver nitrate eyewash to prevent infection is common in many industrialized countries — and in some developing countries — but it has been abandoned in Kenya.

#### THE AIDS ENIGMA

There are about 6000 reported cases of AIDS in the world today, 4000 of them in the United States. In the Third World, Haiti and Zaire are the hardest hit by this STD. Although not widespread, this disease is disturbing since it cannot be treated and is considered fatal. According to Dr. Francis Thomas of the Haitian study group in Port-au-Prince investigating Kaposi's Sarcoma and opportunistic infections, 75 percent of AIDS victims in Haiti are in the capital region, including the popular area called "Carrefour," where there is a high concentration of male and female prostitution. Among the factors associated with this disease are male homosexuality and blood transfusions or injections with non-sterile equipment. Dr. Jean Odio of the Clinique universitaire in Kinshasa, Zaire offered comparable findings. The percentage of AIDS victims in that country is one of the highest in the world — 20 cases per 100 000 inhabitants each year. One interesting finding in Zaire is that there is an almost equal number of female victims of AIDS. Research in progress in the United States and France has identified the virus that causes AIDS. But neither group of researchers — the Institut Pasteur de Paris nor the members of Dr. Robert Gallo's group at the National Cancer Institute in the United States — believe that the production of a vaccine is close at hand.

#### CHALLENGES FOR THE THIRD WORLD

By 1986, three-quarters of the world's population, five billion people, will be living in the Third World. Several participants at the meeting noted that for Third World inhabitants the risk of contracting an STD was much greater. In a study conducted in a poor area of Nairobi, Kenya, about 500 prostitutes were identified out of a population of about 14 000. Nearly 40 percent of the prostitutes had an STD. If they were to have on the average four contacts per day, total possible STD contacts would be approximately 800. At the end of one year, with an infection rate of 40 percent, there would be no less than

2.7 million chances for infection.

One of the most difficult challenges to be met is that posed by certain strains of gonococci that destroy penicillin, thereby requiring use of another antibiotic, such as tetracycline. Tetracycline is much more expensive, too expensive, in fact, for developing countries. The IDRC is currently financing a series of research projects in Argentina, Brazil, Jamaica, and Chile to study various types of antibiotics in the treatment of gonorrhea. Another project, at the University of Nigeria teaching hospital, will concentrate on gonorrhea in university women.

Dr. Yamil Kouri from Puerto Rico, chairing the plenary session at the end of the meeting on the global impact of STD and Treponematoses, urged developing countries, for the sake of their own people's health and in the name of economic development, to become more involved in the fight against STD. He pointed out that, as was the case in Haiti, STDs could pose a serious threat and could even drive down the gross national product. He deplored the lack of accurate data on

the real implications of STDs, adding that since the extent of the damage could not be determined, serious attention could obviously not be given to detection, research and treatment.

Dr. A.R. Brathwaite, a participant in an IDRC-financed research project in Jamaica, stated at the end of the meeting that diseases were becoming more and more difficult and costly to diagnose and treat, and that economic difficulties were forcing Third World countries to cut back on health care services at the very time they should be increasing them.

Numerous specialists from all over the world travelled to Montreal to discuss the magnitude and alarming diversity of the 40 types of sexually transmitted diseases. One conclusion became evident: without a profound change in attitude, scientists would be unable to stamp out this epidemic. Dr. Kouri concluded that doctors, governments and anyone else who could be reached had to be convinced that the ignorance and taboos surrounding these diseases had to be overcome if we hoped to reduce the number of people afflicted with STDs. □

## AN AGENDA OF CONCERN

### Gonorrhea

The World Health Organization (WHO) estimates there are 250 million new cases of gonorrhea worldwide each year. Once diagnosed, the disease is usually easily treated and cured in 95 to 98 percent of cases. In 1976, however, a strain of gonococci was isolated that destroyed penicillin — until then an effective method of treatment. These strains, known as PPNG (penicillinase-producing *N. gonorrhoeae*) are on the increase in every part of the world. (Other antibiotics are used successfully in the treatment of these cases but are much more expensive.) A network of projects, financed by IDRC, in Argentina, Brazil, Jamaica and Chile, has been set up to study these new strains of penicillin-resistant bacteria.

### Syphilis

The occurrence of syphilis peaked during World War II, but with the advent of penicillin and the end of the war, rates began to decline. The disease is caused by the bacterium *Treponema pallidum*, which survives only for a short time outside the body but may persist for 50 years or more within the body.

A research project, financed by IDRC, aims at determining the incidence of syphilis in pregnant women in certain regions of Zambia, as well as evaluating the num-

ber of cases of congenital syphilis. Examinations during the course of the pregnancy will detect the disease, and early treatment will prevent its transmission to the unborn child.

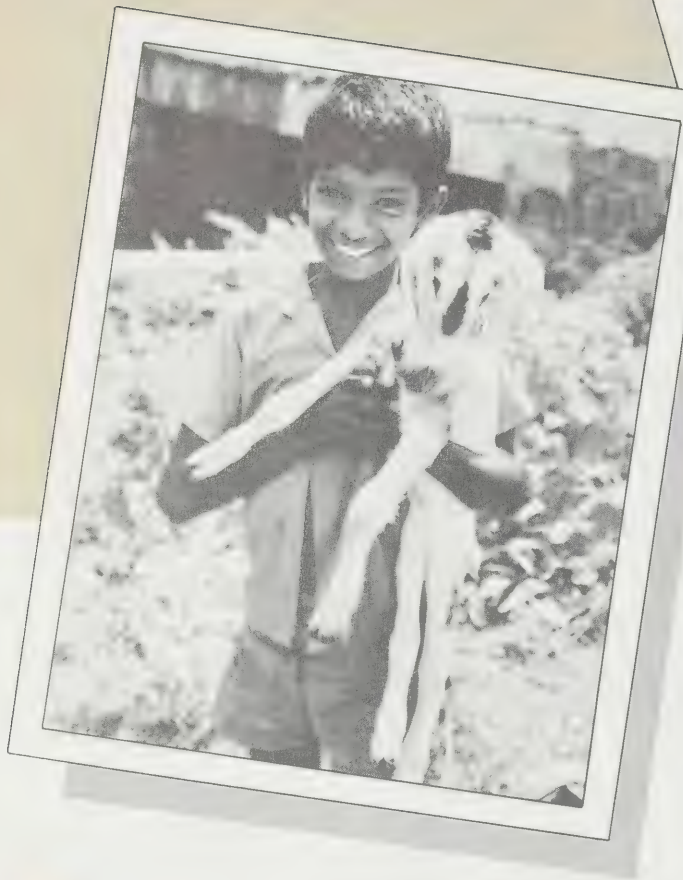
### Hepatitis B

Hepatitis B is one of the conditions that may be transmitted by modes other than sexual intercourse.

A person may contract hepatitis B without any symptoms or may have nausea, fatigue, fever, loss of appetite and sometimes jaundice. Similarly, the majority recover without any serious after-effects. Small percentages of patients, however, develop chronic or continuing hepatitis. Some people remain infectious all their lives. In Africa, however, cancer of the liver — a late complication of the disease — is a major cause of death.

A new vaccine is effective to immunize against hepatitis B, but it is expensive and impossible to immunize everyone at risk. A project financed by IDRC at the Universiti Sains Malaysia has been set up to determine the rate of prevalence of the disease among certain groups — notably, pregnant women and their newborns, children between the ages of one and ten, and blood donors and receivers — to identify the groups for whom the vaccine would be most beneficial.





## **SHEEP AND GOATS**

### SMALL RUMINANTS WITH LARGE POTENTIAL

ZULF M. KHALFAN

Often called “the poor man’s cow,” sheep and goats are generally neglected in the food production systems of many developing countries. Their economic importance to agricultural development is often overlooked by researchers, scientists and governments. Usually, they are brushed aside as environmental degraders — a situation that, more often than not, is due to lack of proper human management. As well, products from these animals tend to be consumed by the producing family, and therefore never reach the marketplace.\*

But these small ruminants produce vital food and generate income for some of the world’s poorest people. And, if properly produced, they could prove very beneficial to developing countries, as they have several practical advantages over larger ruminants such as cattle. Like other ruminants, sheep and goats can convert low-quality fibrous feeds to high quality products. However, they have a higher biological efficiency than cattle in converting that fodder into meat or milk,

and they derive most of their diet from products unusable by humans.

Though they are generally owned by poor farmers (96 percent of the world’s goats and 56 percent of its sheep are located in developing countries), sheep and goats are the world’s main domesticated small ruminants in terms of total numbers, food production and fibre yield.

Sheep and goats have a number of characteristics that offer considerable potential for increasing production of meat and milk, as well as the incomes of smallholders in developing countries.

Their small size generally makes sheep and goats easier to handle, especially by women and children. Shelters and pens are simple to construct and less costly to build than those needed for other livestock.

The smaller size of the ruminants is associated with lesser yields of meat per head slaughtered and milk per lactating female. Yet these small quantities are often enough to meet the

daily needs of subsistence families with limited ability to preserve surplus food products.

As well, the lower cost of nutrient requirements per head could mean that sheep and goats may fit the limited resources of small farms or marginal grazing lands that cannot sustain larger ruminants throughout the production cycle. Moreover, lower capital costs per head give rise to potentially more rapid cash flow, making sheep and goats less risky investments and more affordable by small farmers. Consequently, the economic impact of losses is less for sheep and goats than for cattle.

Sheep and goats are also adaptable to various environments. Their different grazing habits often complement each other and cattle. Sheep and goats are more selective feeders than cattle, tending to select the better portion of plants. Because goats are browsers — whereas sheep and cattle are grazers — they can feed upon a larger range of plant species. This is

\*Winrock International, “Sheep and Goats in Developing Countries: Their Present and Potential Role,” A World Bank Technical Paper, 1983, Washington, D.C., U.S.A.





*Goats and sheep have many advantages for the small and subsistence farmer in developing countries. Their small size means they can be managed by children, and their feed and housing requirements are simpler and less costly*

especially advantageous under dry range conditions in which the surviving vegetation tends to be deep-rooted shrubs and bushes.

Sheep and especially goats are more agile, allowing them to feed over much rougher terrain than cattle. They can also travel further without water. As a result, their feeding range is widened, as compared to other ruminants.

It is a popular misconception that sheep and goats alone are to blame for land degradation. On the contrary, when properly managed, these small ruminants are capable of stabilizing or regenerating land subject to erosion. Goats have been used to rehabilitate rangeland affected by noxious shrubs, while goats resistant to trypanosomiasis (sleeping sickness) have been used to clear the low brush habitat favoured by the tsetse fly that spreads the disease in Africa.

Sheep and goats are also more profitable under drought conditions, as they show a higher survival rate than cattle. Moreover, because of higher reproduction rates, their numbers can be restored rapidly after a drought. In arid areas of the West African Sahel, cattle and goats are often raised in mixed herds. After years in which cattle have been reduced due to severe droughts, herders use goats to rebuild

their capital stock, eventually converting goats to cattle.

In some breeds, the short reproductive cycle and multiple births are also advantageous. Females may conceive in one period of good feed and lactate in the next. Their 8-to-9-month birth intervals often fit the seasonal rainfall patterns in many regions better than the 14-to-16-month intervals of cattle and buffalo. Prolific breeds can produce twins, triplets, or quadruplets.

However, sheep and goats are not without characteristic disadvantages. Their proliferation is hindered by their susceptibility to predators because of their small size. They are easy targets for theft, have low individual commercial value relative to input and labour costs, and are potential environmental degraders when left to graze uncontrolled. And although they are less susceptible to hoof and mouth disease and trypanosomiasis than cattle, they are also more susceptible to certain respiratory diseases and internal parasites, especially when kept in large flocks and herds.

Small ruminant production and productivity can be improved by modifying feeding, management and health practices. IDRC is currently involved in a goat production project in Peru, as well as one involving goats and sheep

in Zimbabwe. The general aim of these projects is to develop improved techniques for sheep and goat rearing that are suitable to the ecological and socioeconomic conditions in both areas. This includes nutritional, breeding and health components, as well as management and marketing strategies.

Most small ruminant producers identify the lack of available cultivated forages, water, and feed supplements as the main obstacles to better production. Efforts are also needed to improve animal breeds.

The result of the projects, and the improving of production, will not only help the small farmers who derive income from the production of sheep and goats, but the urban population whose traditional diet consists of goat milk and cheese. Those using leather and wool will also benefit.

The future for sheep and goats could be bright. A re-evaluation and systems approach will enable sheep and goats to gain their due recognition as important contributors to small-scale farms in poor regions, where they can then act as a lever to improve the economic state of those relatively poor who depend on them as a way of life. □

*Zulf M. Khalfan is a freelance Ugandan journalist now living in Ottawa.*



# INSECT VS INSECT

GUN LUNDBORG

Photo: Hans Herren/IITA



## BIOLOGICAL CONTROL OF CROP PESTS ON THE FIELDS OF AFRICA

**D**uring the last 10 years, a drama has taken place on the fields of Africa, from Angola in the south up to Senegal in the west. The actors are two Latin American insects inadvertently introduced into Zaire and Uganda — the green spider mite and

been a problem, as cassava is propagated by its own cuttings, grows well in poor soil, can withstand prolonged drought, and indeed, gives higher outputs on lower inputs than any other food crop in Africa. Moreover, until recently, diseases and pests had left it undisturbed. Now two diseases — the cassava mosaic disease and bacterial blight — have lately become a problem. Two pests — the green spider mite and the cassava mealybug — have moved in to take advantage of the situation.

Dr Sang Ki Hahn, director of IITA Root and Tuber Improvement Program (recently honoured with a chieftancy title "King of the farmers" for his contribution) explains: "I had been urgently requested by the Zairian Government to recommend a solution to a cassava disease and, on that occasion, I also noted, for the first time in African history, the presence of an insect causing severe bunched-up symptoms on the cassava plants in Zaire. The area was then quite limited," he continues, "but I felt immediately that the pest could be potentially severe." This was in March 1973; the following year, Dr Z.M. Niyra published his studies on the green spider mite, which had been inadvertently introduced in Uganda in the early 1970s.

There was no time to lose. The green spider mite was expanding at the rate of 480 kilometres a year in every direction, and the cassava mealybug was advancing in lockstep. Yet neither of them was able to fly.

When the female green spider mites have depleted the food supply of leaf chloroplasts, they drop, as if on parachutes, by silken threads that they produce and drift in the wind to another plant. Mealybugs have a different technique: they inject a toxin into the cassava plant that causes the leaves to curl and protect them until it is time for them to be taken to the next plant by the wind. That happens when the shelter has withered and fallen off.

Much initiative and energy are displayed by both pests, but no less is evident on the part of the IITA Root and Tuber team. Their strategy is to attack on two fronts by breeding cassava clones that are tolerant to mites and mealybugs and by introducing to Africa the missing natural enemies of the pests.

When Hahn had reviewed hundreds of thousands of cassava seedlings —



(Top) An adult predator beetle, *Hyperaspis* Sp., and its larvae have a feast of mealybug eggs, nymphs and adults. The mealybug, *Phenacoccus manihoti*, is a major threat to Africa's cassava crops.

(Above) A female parasitoid wasp, *Apoanagyrus lopezi*, deposits a single egg in a mature mealybug. The wasp, only 2-3 mm long, is the major player in entomologists' fight against mealybug through biocontrol.

the cassava mealybug. Unchecked by natural predators, as they are in their native lands, the new arrivals have cut a swath of destruction across 14 countries and threatened another 17 with infestation. Losses for the farmers have been heavy and felt more strongly in people's bellies than in their pockets — both of which, as far as the farmer is concerned, are chronically empty.

"Cassava is the crop of the poor, of the people that have the least in the world today," says Dr Ermond H. Hartmans, Director general of the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria. "It touches on the lives of some 200 million people for whom cassava represents more than half their daily calorie intake. The losses are estimated to be in the range of US\$2 billion per year, with the result that cassava prices have risen five times over the last two years."

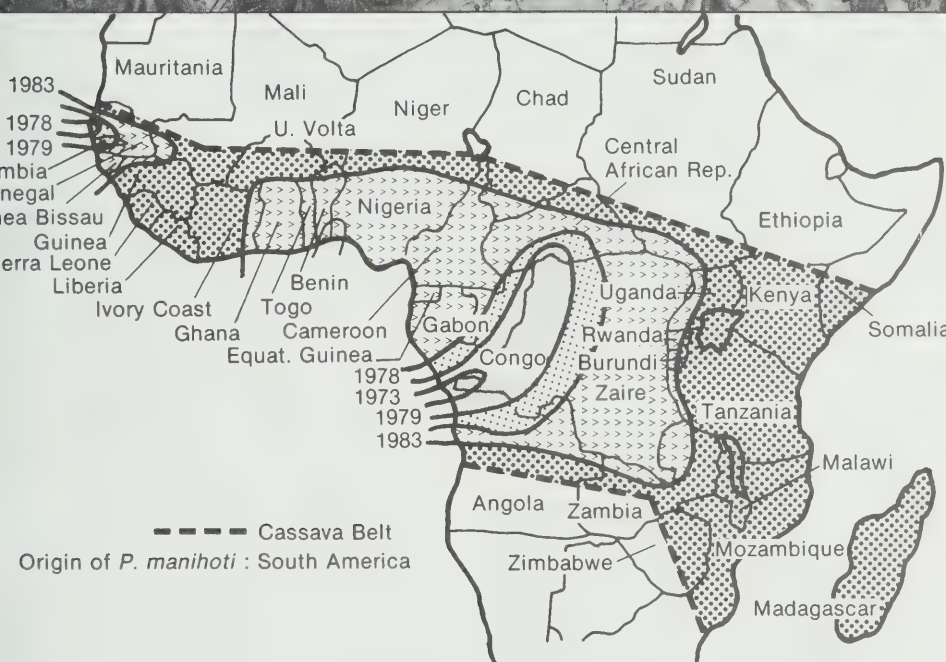
Cassava has been grown in Africa for the last four centuries. Portuguese sailors were the first to take it there from South America. The better the people learned to process the root (to reduce toxic elements) the more popular it became. Adaptation had never





Crop damage on cassava caused by pests (left) and the spread of cassava mealybug in Africa south of the Sahara over a 10-year period (1973-1983).

Photo and map: IITA



and for this he had to move in the wake of the pests as they spread over the continent — he made an interesting discovery: both the green spider mite and the cassava mealybug displayed a positive antipathy toward cassava plants with hairy leaves, petioles and stems, or with high pubescence, as it is called. Several such varieties have since been developed and distributed around the continent: in Nigeria by cuttings, and in the other countries by tissue culture or seeds.

But in view of the severity and urgency of the problem, IITA has undertaken a biological approach as well with Dr Hans Herren, entomologist, as teamleader.

"The biological control approach," explains Herren, "consists in trying to find the area of origin of the pests, in our case South America, collecting predators and parasitoids, sending them into quarantine (as they, in their turn, can have other parasites), and bringing them to our lab at IITA for biological studies, mass-multiplication and release. Such action will not add extra problems to those that Africa already has, as some people may believe. The natural enemies will only

feed on the cassava mealybug or on the green spider mite."

From very early on, IDRC (along with a number of other organizations) supported the search for means of biological control. For several years scientists from IITA, from the Centro Internacional de Agricultura Tropical (CIAT) and from the Commonwealth Institute of Biological Control (CIBC) were on the hunt for the areas of origin of the green spider mite (*Mononychellus tanajoa*) and the cassava mealybug (*Phenacoccus manihoti*) and their natural enemies. The first mealybug was eventually found in Paraguay by a colleague of Herren's, Dr Anthony Bellotti of CIAT, Colombia.

"We have now a few good guys," explains Herren, "with excellent appetites. For some of them it is even hard to find enough food to keep them alive in the lab." One belongs to the genus *Diomus*, a tiny but extremely prolific predator beetle, that prefers the eggs of the mealybug to the mealybug itself. The star enemy, however, is a parasitoid wasp, *Apoanagyrus lopezi*, discovered by Dr Maajid Yaseen, principal entomologist at CIBC, lays its eggs inside mealybugs — one egg per

mealybug. Once hatched, the larva feeds on the entrails of the mealybug, thus killing it.

The next step is now mass-rearing and release of the enemies. This requires an insectary to breed the enemies, aircraft for their release, and more money for the program.

The area covered by the pests is now around 5 million ha out of a total of 9 million ha of small, scattered cassava fields. The only efficient and rapid means of reaching these is by air.

"An aircraft will be firing plastic shells, inside of which some 1500 enemies will be packed. We are planning to mix the mite predators, which will not be able to fly, with the winged mealybug predators and parasitoids," affirms Herren, "so that the mite predators can piggyback on their winged fellow-travellers. This solution will not require any extra work."

IITA's geographic position in the centre of the pest area is excellent: over 10 million enemies per day will be ready for one aircraft releasing within a swath 3-6 km wide. In this way, it is expected to colonize more than 2.5 million ha of cassava fields in 5 years.

So far, 21 African countries have asked for natural enemies to be transported to and distributed in their countries. The cassava losses are expected to decrease gradually by 10 percent during the first year to 90 percent during the fifth year. In other words, after the eighth year, according to this calculation, a cassava yield worth US\$1.7 billion dollars will be saved.

The most remarkable thing about biological control is that it increases production without extensive interventions in farmers' activities. The estimated US\$30 million required to spread the predators over Africa is a one-shot investment. Once the predators are delivered, a natural balance between them and the mealybugs will follow, with the predator population shrinking as mealybugs are eaten up.

As entomologist Robert van den Bosch expressed it: "Insects are formidable animals. They don't have to think, for they have built-in mechanisms that take care of that need. And since they don't think, they don't make deliberate mistakes. Their formula has worked splendidly for 300 million years and is working with great efficiency in their joust with humans."

In letting the insects joust among themselves, scientists are aligning a new and urgent problem with a very old solution. □

Gun Lundborg is a Rome-based freelance development journalist and contributing writer to IITA.



## ACTION-RESEARCH A NEW SOCIOLOGICAL APPROACH IN DEVELOPING COUNTRIES

**F**or some time there were great expectations that the social sciences might acquire the precision of the physical sciences. Social scientists embarked on models highly imitative of the natural sciences, with much attention placed on the random selection of subjects, identification of cause and effect relationships, use of special instruments to gather data, quantitative measurement of the presumed forces at work, and statistical tests for data analysis. Most of all, this imitation brought with it the notion of value-free science, with the precept that the researcher should not talk about what *should* be but merely what *is*.

Yet, despite the significant progress that has

been made in the understanding of human behaviour in groups and communities, the identification of unvarying social "laws" has proven elusive. Social experiments have been marked by uncontrollable changes in the implementation of programs and treatments. Data gathered on social experiments — often obtained through questionnaires administered only one time — have tended to reflect static visions and abstractions imposed by the researcher rather than accurate descriptions of the social world. Moreover, the usefulness of social science research for policymaking has been limited because the findings tend to be equivocal.

In recent years a new consciousness has

emerged, both among social scientists and within groups long used as subjects of social science research. Established experts in conventional sociological research now concede that quantitative methods can destroy institutions and processes. They admit much of our scientific knowledge really depends on social consensus rather than on absolute truths.

In response to the crisis faced by conventional models, various alternatives have emerged, among them participatory and action-research.

Action-research is not the solution to all the weaknesses in the social sciences, but it is built on certain assumptions and presents certain attributes that render it a useful and appealing approach. This is particularly so in developing countries, where there is an urgency for prompt action as well as for action based on reflection.

First of all, action-research seeks social transformation. This emphasis leads action-research to examine problems that affect disadvantaged social groups and makes the researchers become advocates of their interests. The sympathetic understanding by the researchers working with marginal and oppressed groups has been criticized by conventional sociologists as demonstrating a lack of objectivity, and therefore contrary to the norms of science. But, as sociologist Peter Berger remarks, value-free social science does not mean that the researchers are free of values or unaware of values that exist in a given situation, but rather that they can perceive reality apart from their own hopes and fears.

Because in action-research the researchers develop a close relationship with the community they serve, a different assumption of knowledge is at work. One must let go of the idea that knowledge is the exclusive domain of the expert and that it can be

gathered only through the use of instruments designed and calibrated by the researchers themselves. One must assume that people, regardless of their educational levels and occupation, possess important practical and empirical knowledge that allows them to operate in their current environments. The task of the researchers then becomes not to produce knowledge but to facilitate the construction of knowledge by the community itself.

A second assumption action-research makes toward knowledge is that effective knowledge is not always that which is transmitted from the outside but also that which is gradually produced through the interplay of action and reflection. Hence it is through the community's involvement in the identification of its main problems, in the collective understanding of the dynamics of these problems, and in their eventual solution that both knowledge and action will emerge.

Linked to the notion of knowledge is the issue of "empowerment" — the creation of a feeling among the disadvantaged that they have a say in what is studied, how it is studied, and how it is interpreted. Empowerment has a particularly important purpose in transitional societies where weak social institutions predominate and where in many cases norms regarding participation in decision-making have still to be established.

While action-research has brought a different posture to knowledge and the role of the researchers, it has not produced major innovations in research design and methods. On the contrary, action-research has moved away from the complex and sophisticated research designs of mainstream sociology. For gathering data, moreover, it has not so much introduced new instruments as it has called for multiple sources for the data and placed heavy emphasis on the procurement of informa-



*Returning knowledge to those who generated it: action-research in Ecuador*



tion through informal and interactive processes such as group discussions, dramatizations, and role playing. The fact that action-research tends to use previously known qualitative data-gathering procedures, as well as simpler approaches to problem definition and analysis, has been noted by certain critics who then say that there is nothing new in action-research except lax scientific standards. But action-research is not a one-tool innovation; it is a new philosophy of social science research with a more modest attitude toward knowledge and a reduced sense of superiority toward the groups under study.

The process of action-research does go through conventional sociology's logical sequence of problem definition, data gathering, and data interpretation. However, the process tends to be less linear and is marked by continuous interaction between researcher and researched. Actual experience with action-research indicates that it can take various forms. The involvement of community people varies from project to project and does not always occur at all key stages of the research process. Also it appears that the action component of action-research is not always immediate. In some cases, lags may exist.

Although numerous experiences in action-research remain yet to be documented and evaluated, preliminary assessments of this approach show that it holds great potential for work with heretofore powerless groups such as peasants and women. India and various Latin American countries have seen many instances of action-research; most of the findings come from these countries.

Through its frequent use of group discussions, action-research enables marginal groups to become active social forces, to express their viewpoints, to evoke their experience, and to analyze their living con-

ditions. In the case of women, long subjected to isolation within the domestic sphere, action-research offers a useful bridge between the home and the public sphere.

The use of less-traditional methods of data-gathering techniques such as group discussions, dramatization, testimonials, and popular theater allows groups not familiar with the written word and uncomfortable with outsiders to be more effective in producing and interpreting data.

The participation of individuals in problem identification and subsequently in problem solving does bring forward the points of view of these individuals and significantly facilitates program implementation.

As are several other international development agencies, IDRC is supporting some projects using action-research approaches. Among these is a project in Ecuador to mobilize women in the development of training and income-generating programs (see box). A study in India is comparing six case studies of action-research projects; through participatory methods the researchers will analyze the nature of the action-research process and assess its role in training and evaluation. A third study, an effort to improve research and administrative skills of individuals engaged in production and service cooperatives, uses the experiences of these persons as the point of departure to systematize their knowledge; this project is presently being carried out in Bourkina Fasso (Upper Volta). More recently IDRC jointly sponsored a seminar on action-research with the United Nations Economic Commission for Latin America (ECLA) in Santiago, that focused on marginal women in urban areas.

Action-research has a long and difficult road before substantive and methodological issues are resolved.

Nonetheless, action-research represents a very useful attempt to reduce

some of the polarities brought about by modernization, such as developed and underdeveloped, expert and layperson, and vanguard and led. Someone has remarked that tradition and modernity relate to each other through a variety of compromises

and mutual adjustment — a process that has been called "cognitive bargaining." If action-research can help in this process, it can only be beneficial to social transformation. □

*Nelly Stromquist is Senior Program Officer in the Social Sciences Division of IDRC.*

## **PROMOTING THE ORGANIZATION AND ADVANCEMENT OF LOW-INCOME WOMEN IN ECUADOR**

Claiming that problems of development affect all people — men and women, young and old — many studies have failed to examine conditions under the sphere of women's responsibilities and to capitalize on the potential that women have as major agents in socioeconomic transformation. Further, whenever research has taken place, it has rarely been defined by the women themselves.

A team of CEPLAES researchers has been working with women's groups in low-income neighbourhoods in Quito now for two years. CEPLAES, Centro de Planificación y Estudios Sociales, is an independent research centre concerned with social planning and change. The action-research project seeks various objectives. It will investigate the socioeconomic conditions of these women, paying particular attention to their strategy for subsistence through self-help and collective efforts. The project will also provide leadership training and promote the creation of self-reliant organizations, train women in self-selected income-generating skills, and develop a methodology for action-research that can be transferred to other low-income communities in Ecuador.

Two communities, an old and a recent settlement, were chosen for the study to examine whether the new community — anticipated to

show less stability and integration of its members and greater problems of urban living and employment — would present greater potential for women's mobilization. A broad knowledge of the neighbourhood was first obtained through observations and unstructured interviews. Later, several group discussions were held to identify the basic needs, interests, and conflicts affecting the organization of the community.

A series of home visits and surveys, conducted by the researchers and the women themselves, pinpointed further the critical problems facing the community. These problems centered on needs such as water and sewage, and for better disease prevention practices. The information was analyzed and interpreted through group discussions: various activities were identified for subsequent action. A successful demand was made of government authorities to provide promised services, a course on health issues was started, and new activities dealing with preschool services and nutrition were planned. A health manual was also designed.

As a result of the action-research activities, women leaders have been identified. Women's associations now exist in each community. A final product will include a manual presenting the methodology of action-research employed.



# BRIEFS

## Minigenerator the size of a thermos

China has produced a new tiny turbogenerator that can make small mountain brooks or irrigation ditches generate electricity.

The generator, manufactured by the Nanjing Farm Machinery Research Institute, is the size of a large thermos bottle and weighs 25 kilos. This "family generator," as it has been dubbed, can operate on streams with a flow of 0.025-0.030 cubic metres/second, a speed of water that would fill an average pail in half a second. It can also operate on a stream with a head of 2.5-3.5 metres.

A small number of these generators have been tried out in the rural areas. Chen Furong, a flower grower in Liyang county, Jiangsu province, uses a turbogenerator driven by water from a nearby reservoir to light his home and to provide heating for a hothouse formerly heated by coal.

The unit is made up of three parts — the dynamo, turbine and load regulator. The dynamo, which generates the electrical power by rotating an armature through a magnetic field, is cylindrical

in shape and is encased in a waterproof cover 15 cm wide. The turbine, which is turned by the water from the stream and transmits rotary mechanical power to run the dynamo, is smaller in size, resembling a 30-cm loudspeaker. The turbine and dynamo are connected by an axle, and pipes are fitted into both ends of the water turbine. The load regulator, which is about the size of a table radio, is wired to the generator and the electrical appliances in the home and hothouse. It works automatically, ensuring that too much power is not drawn and that a constant level of power is maintained.

Chen says enough energy is generated daily to light his three-room cottage and to operate a television set and a rice cooker. The power generated also heats his 64-square-metre hothouse and operates a water pump. He estimates that the minigenerator will pay for itself in six months.

Zhao Shukai, chief engineer of the farm research institute that built the generator, says it is suitable for use in flat and hilly regions as well as on small islands. It can work

either by a mountain stream, a pond, an irrigation ditch, or at the outlet of waste water of a factory.

Shukai says the unit was primarily built for peasant families. He says installation is simple as no powerhouse is required. All that is needed is a concrete support for the generator and a few lengths of pipes.

The building of minigenerators is one of China's key research projects. The first batch passed testing in December 1983. Mass production was scheduled to start in the second half of 1984.

*Wu Chiang,  
China Features*

## Arid lands conference

An international conference, scheduled for 20-25 October 1985 is expected to draw between 800 and 1000 scientists from around the world to focus on the management, conservation, and development of arid lands.

The conference, titled "Arid lands: today and tomorrow," is co-sponsored by the University of Arizona, Unesco, and the U.S. Man and Biosphere Program. It will have discussions on water use, conservation and allocation; agricultural systems, and the adaptations of their plant and animal resources; natural resources reclamation, conservation and use; and human habitat — architectural, urban planning and cultural adaptations.

Papers on all topics relating to arid lands are welcome. They should be based on new research data gathered by the authors themselves. Scientists and resource managers must submit

200-word abstracts of presentations by December 31, 1984. Selection of successful submissions will be announced by February 1, 1985.

Inquiries: Dr G.P. Nabhan, OALS, University of Arizona, Tucson, Arizona 85721, U.S.A.

## Embryo transfer successful

Surrogate motherhood has become a part of trypanosomiasis research.

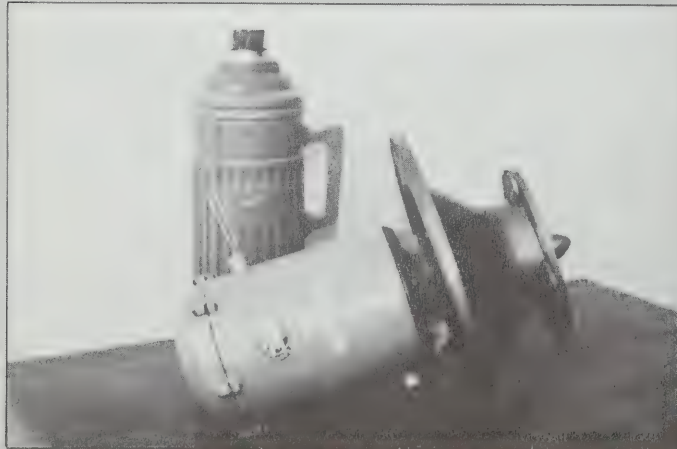
Embryos obtained from the mating of purebred N'Dama cows and bulls in The Gambia were surgically transferred into Boran heifers at the International Laboratory for Research on Animal Diseases (ILRAD) at Kabete in Nairobi in June 1983. The following spring the first N'Dama calf, a heifer, was born. Four more heifers and five bull calves followed shortly.



*N'Dama calf and surrogate mother*

N'Dama cows are particularly interesting to scientists at ILRAD because they show a degree of resistance to trypanosomiasis, a serious parasitic disease that affects domestic animals in Africa.

ILRAD scientists are trying to find ways of controlling trypanosomiasis and other livestock dis-



*Family generator for small-scale hydroelectricity*



eases that seriously limit world food production. They hope to find genetic traits that identify relatively resistant animals. These animals can then be used for livestock improvement programs, or be studied to find possible methods of increasing resistance in other animals.

The N'Dama is an ancient breed now native to West Africa. ILRAD scientists have been studying the resistant N'Dama since the 1970s, but it has not been possible to bring the N'Dama to Kenya because the movement of live animals from West Africa is restricted by international regulations to prevent transfer of diseases. However, working with government authorities in Kenya and The Gambia, scientists are now able to import frozen N'Dama embryos, which are disease-free.

### Robber flies

The robber fly (*Asilid* sp), so named because it kills its prey and steals the contents of its stomach, may serve as a means of reducing the risks of tsetse fly-transmitted human sleeping sickness, and animal trypanosomiasis.

The tsetse fly is just one of the many victims of the robber fly, which is also a predator of mosquitos, butterflies, blackflies and other insects of the Tabanidae family.

Over three times the size of the tsetse fly, the robber, or "assassin" fly first overpowers its victim with its long legs. At the same time, it uses its proboscis to inject a digestive enzyme that dissolves abdominal muscle tissue,

paralyzes, and eventually kills its victim. This enzyme also breaks down the blood meal in the tsetse fly's stomach, reducing it to simpler forms, such as amino acids, on which the predator then feeds.

Getachew Tikubet, an Ethiopian scientist at the International Livestock Centre for Africa (ILCA), has been studying tsetse and tabanid populations in the Finchaa Valley of Central Ethiopia. Tikubet has been using a variation of conventional traps that has caught up to ten times as many robber flies, as well as an increasing amount of tsetse flies and other blood-sucking insects. Previously, only small numbers of robber flies have been trapped, mainly by scientists studying tsetse flies.

So far, little research has been done on the habits of the robber fly, but studying its habitats, population structure, breeding and feeding behaviour may help control the tsetse population, and would be of great benefit in some areas of tsetse-infested Africa.

### International Centre for Ocean Development established

As a result of the Third UN Conference on the Law of the Sea, individual nations now lay claim to the 40 percent of the world's ocean resources adjoining their coastlines. The wealth of the ocean floor beyond these territories remains the common heritage of humanity.

One benefit of the new convention for the protein-hungry developing nations is the opportunity to supplement their food resources and increase employment and foreign exchange by expanding their fishing industries. Studies have shown that the ocean's food potential could be increased four-fold, but achieving that potential remains problematic. Other possibilities for ocean development include tourism, mariculture, mining, and transportation.

The developing countries will now be able to

draw upon the resources of a nonprofit international organization in order to make the most of their extended zones of maritime jurisdiction. The newly incorporated International Centre for Ocean Development (ICOD), situated in Halifax, Canada, will provide information, research, training, and advisory services to assist the developing countries in managing their ocean resources.

As a major maritime nation, Canada has established a reputation in the scientific, technical, and managerial aspects of ocean management. ICOD is intended to complement, rather than compete with, other national and international organizations involved in ocean development. It will sponsor projects at the specific request of developing countries, but most of these activities will be implemented through existing institutions and agencies, both in Canada and abroad, and in the public and private sectors. ICOD: P.O. Box 2003, Station M, Halifax, Nova Scotia, Canada B3J 2Z1.

### Cooperatives North and South

Development that does not increase people's control over their own lives — even if it does improve their material welfare — is not development at all.

This principle was underlined during the recent North-South Cooperative Development Study held in Castries, St Lucia and Ottawa, Canada. The study program was developed on the premise that the unique Canadian experience in cooperative development — particularly amongst the indigenous peoples — probably had something to offer would-be cooperators in the Caribbean.

The program was organized for the representatives of cooperative organizations and concerned governmental agencies from the Caribbean islands of Antigua, Barbados, Dominica, Jamaica, St Lucia and Trinidad-

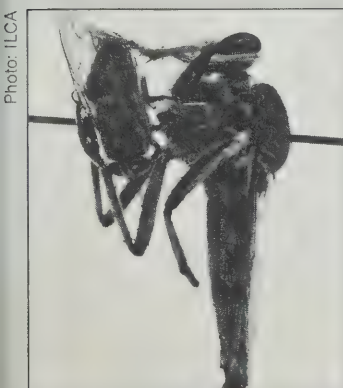
Tobago by the Cooperative Union of Canada (CUC), in collaboration with the Cooperative Development Foundation (CDF). It was supported by the Canadian International Development Agency (CIDA).

The North portion of the study program began with a week-long conference in Ottawa during which the Canadians provided the Caribbean representatives with background information on cooperative-building — including the role of government in cooperative development, and marketing arrangements. Caribbean representatives spent the next four weeks travelling in the Northwest Territories, Saskatchewan, and Québec in order to observe firsthand the Canadian cooperative experience: the role of cooperatives in local economy, their effectiveness, and the problems they encounter. Workshops in Ottawa after those trips gave the Caribbean cooperators a chance to compare notes and consider how the Canadian cooperative process could be adapted to the Caribbean situation.

A draft outline of a cooperative development profile was one of the results of these workshops. These ideas were later developed by the South portion of the Conference into a "broad, useful guideline" for cooperative development.

The South portion also came up with a list of regional initiatives related to cooperative development, ranging from a harmonization of legislation governing cooperatives to representing the cooperative movement at CARICOM meetings. A task force is to follow up on these initiatives and it is expected that the North-South Cooperative Study will have significant impact on the cooperative movement in the region. Requests for a complete report on the North-South Cooperative Development Study should be addressed to the Cooperative Union of Canada, 237 Metcalfe Street, Ottawa, Ontario, Canada, K2P 1R2.

Aleksandrs Sprudz



Robber fly drains tsetse victim





**Refugees learn  
to live... page 12**

In addition to IDRC *Reports*, the Centre publishes a wide range of material on development issues. These include scientific monographs, reports, and bibliographies on specific IDRC research areas, as well as general interest literature. These publications represent research interests and activities supported by IDRC in agriculture, food and nutrition, population, health, education, information, and social sciences. Films describing the Centre and some of the areas of development research are also available. A catalogue of current material, publications or films, is available from the nearest IDRC regional office or from IDRC in Ottawa (see page 3 for complete addresses).

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VOLUME 13, NUMBER 4 — JANUARY 1985

# Reports

THE  
IDRC



## Malaria vaccine?

- consumer advocacy
- science literacy
- bamboo and rattan
- multilingualism  
in India
- René Dumont





# LETTERS

## Data supply

The Visayas State College of Agriculture (VISCA) is an agricultural institution dedicated to promote agricultural instruction, research, and extension in the Visayas region of the country. Concerned with improving agricultural technology, its end goal is to uplift the living conditions of the small Visayan farmers: the marginal landholders, sharecroppers, landless agricultural labourers, kaingineros or shifting cultivators, and the small fishermen.

With this conviction, the Center for Social Research (CSR) was created at VISCA in 1982. At present, the Center is doing survey studies, evaluative research studies, and action-research projects using the participatory or farming systems approach. Besides all these, we are also trying to establish a data bank on small farmer development starting with the Eastern Visayas area.

Among our viable sources of relevant literature is *Reports*, which we usually have access to through individuals with some links with IDRC. We would now like to be able to avail ourselves of your very informative publication directly. We know it can provide us access to rich and substantive documentation and insights from your own experience in research and extension, or any of your development efforts, for that matter. We would be happy if you can also send us regular copies of *Reports*.

Grace Len Galipayan  
Center for Social  
Research in Small Farmer  
Development  
Leyte, Philippines.

## All in a name

I read with interest the article on curriculum development for Indochinese refugees ("Books for the bamboo cities, *Reports* 13(3) October). However, I would like to clarify one point concerning the recent history of Cambodia contained in the introduction.

The author, Dr Supote Prasertsri, writes that Cambodia is now officially "Democratic Kampuchea." The point to emphasize is that Democratic Kampuchea was the name of the Khmer Rouge government of Pol Pot from 1975-79 and now describes the coalition of resistance fighters that is composed largely of the Khmer Rouge. While this coalition of Democratic Kampuchea represents the people of Cambodia at the United Nations, the current regime, whose capital is Phnom Penh, is called the People's Republic of Kampuchea. It is this Vietnamese-backed government that controls a majority of the territory to which the author is alluding.

This may appear to be small point, but for the players in this seemingly never-ending political struggle, it is critical.

Jean Lash  
Phnom Penh,  
People's Republic of  
Kampuchea

## Schistosomiasis test

I was quite surprised to read in your July issue (*Reports* 13(2), Briefs) that diagnosis of schistosomiasis by urine filtration was recently developed by PATH (Program for Appropriate Technology for Health). It has, in fact, been the method recommended by

the Organisation for Co-operation and Co-ordination in the Control of Major Endemic Disease since 1974 (OCCMED in Plouvier et al. *Trop. Med.* 1975). This method was developed from more complex techniques (Bradley), simplified and evaluated in the field. The Centre de Recherches sur les Méningites et les Schistosomiasis (CERMES BP 10887, Niamey, Niger) is currently making a comparative evaluation and can supply any information required.

Dr J.L. Rey  
Institut National de Santé  
Publique  
Ministère de la Santé  
Publique et de la  
Population,  
Ivory Coast Republic.

*Editor's note — Although, in fact, it was not PATH that developed this method of diagnosing schistosomiasis, they are responsible for developing the simplified kit for easier and cheaper use in the field.*

## Information note

The article on the hormonal contraceptive ring, which appeared in *Reports* 13(2) July 1984 was adapted with the permission of the Population Council from Ellen E. Hardy, Quintina Reyes, Fernando Gomez, Ramon Portes-Carrasco, and Anibal Faundes, "User's Perception of the Contraceptive Vaginal Ring: A Field Study in Brazil and the Dominican Republic," *Studies in Family Planning* 14, no.11: 284-290.

*Letters from readers are welcomed, and should be addressed to:  
Editors, IDRC Reports, P.O.  
Box 8500, Ottawa, Canada  
K1G 3H9.*



# Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa Canada K1G 3H9. *Editor-in-chief*: Rowan Shirkie. *Associate Editor*: Jacques Dupont. *Spanish edition*: Stella de Feterbaum. *Layout*: Alice Herczuk. *Staff photographer*: Neill McKee

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**Cover:** A test for detection of mosquitoes infected with malaria-transmitting sporozoites. Although new and promising techniques are marshalled against it, malaria continues to be the single largest cause of death and disease in the world. See story page 3.

Photo: Al Giese/NYO Medical Center

**Back cover:** *Bambusa vulgaris* (Bamboo): shoot, leaves, and culm. Exploited for centuries, bamboo and rattan have only recently begun to benefit from research. See story page 13.

Drawing by P. Sharma

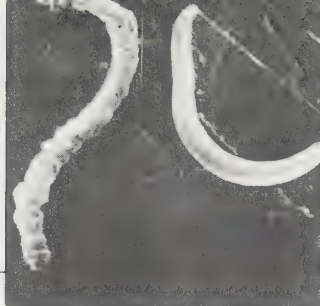
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The crescent-shaped sporozoite stage of the malaria parasite, the form injected by a mosquito. The roughened surface of the sporozoite on the left is the result of attack by antibodies: a potential vaccine at work. Photo: New York University Medical Center

# MALARIA

## THE KING IS THREATENED

NANCY JOHNSON SMITH

**"T**he king of diseases," malaria, the single largest cause of disease and death in the world, received royal treatment in Calgary, Alberta, at the XI International Congress for Tropical Medicine and Malaria last fall. The congress, supported in part by IDRC, brought 1500 health professionals representing 68 countries to participate in almost 300 seminars and workshops covering all the major tropical diseases.

Thirty of the sessions dealt specifically with the malarial parasite and its *Anopheles* mosquito vector. Topics on malaria covered the entire spectrum of genetics, epidemiology, chemotherapy, health care delivery and training and, most publicized of all, vaccine development.

At the opening ceremonies, Nobel Prize winner Dr (Sir) Gustav Nossal, Director of the Walter and Eliza Hall Medical Research Institute, Victoria, Australia, set the theme: "Vaccines are history's most cost-effective public health tool. The importance of a malaria vaccine compares to that of the Salk vaccine."

Just how close the world is to enjoying such a health advancement was reported at the congress for vaccines to all three major stages of the parasite's complex life cycle.

However, in his opening address, Dr Adetokundo Lucas, Director of WHO's Special Program for Research and Training in Tropical Diseases (TDR), warned, "It would be hazardous even at this stage to attempt to predict when the first trial of a malarial vaccine will take place in humans, or when such vaccines could be expected to come into operational use. What can be said emphatically is that more progress has been made towards the development of malaria vaccines in the past decade than in the preceding 100 years."

Most advanced is the ant sporozoite vaccine being developed by the team of Drs Ruth and Victor Nussensweig of New York University Medical Center (NYU) and groups at the National Institutes of Health and Walter Reed Army Institute of Research in Washington. The thread-like single-celled sporozoite is the stage of the *Plasmodium* parasite that enters the blood-

stream when an infected mosquito bites.

In several congress papers, Dr Ruth Nussensweig and members of her research team gave biotechnical details of their work that has led to the identification of the main antigen involved in stimulating the body's immune system to produce protective antibodies against sporozoites of *Plasmodium falciparum*, the most deadly of the human malarial parasites. Previously, this team identified similar antigen-antibody reactions for several other primate and human species of malaria.

The *falciparum* antigen is a "circumsporozoite" (cs) protein, part of a family of proteins that covers the whole surface membrane of the parasite. As was widely publicized in August of 1984, the NYU researchers reported they have also determined the biochemical nature of the antigen and the genetic code within the parasite's DNA that directs its production. Nussensweig further noted that, although the malarial antigen-antibody reactions appear to be species-specific, fortunately for the production of an effective vaccine, the several strains of *Plasmodium falciparum* around the world possess almost identical immunogenic antigens.

Critics of the vaccine have stated that sporozoites are in the blood stream for too short a time (several minutes) to stimulate an immune reaction before they penetrate liver cells and are protected from any further detection. In her discussion period, Nussensweig countered with a report that 90 percent of adults over 20 years old in heavily malaria-infested Gambia have antibodies to sporozoites. "That indicates a definite sporozoite-induced immune reaction," she said.

In her paper, Nussensweig suggested three possible methods for producing large enough amounts of antigen to be used for a vaccine. The NYU researchers have already synthesized the cs protein using conventional laboratory biochemistry. And, using genetic engineering techniques, they have inserted the antigen's gene into a strain of *E. coli* bacteria, which allows mass production of the antigen in the future. A third method would be to insert the antigen's gene into the DNA of vaccinia virus, used in the past to vaccinate against smallpox. In a later discussion, she suggested that her vaccine would be best administered to high-risk groups with little natural immunity to malaria, i.e., young children, pregnant women, and foreign travellers into an infested area. The NYU team will begin trials of the proto-vaccines in humans within the year.

Epidemiological assessment of status of malaria, 1982. Map: WHO





Life cycle of the malaria parasite, Plasmodium. An infected Anopheles mosquito (below) bites a vulnerable host and injects sporozoites. Quickly, the sporozoites move through the bloodstream to the liver, where they change into schizonts. Then they emerge into the bloodstream again, invade and destroy red blood cells, and burst forth into the bloodstream as merozoites seeking new red blood cells to invade. A few parasites change into the gametocyte form and enter the bloodstream. If picked up by a mosquito these parasites can multiply and infect the next person the mosquito bites.

Drawing: Carol Ann Morley

Such a sporozoite vaccine would protect against the initial malarial infection. But what would happen, critics ask, if a vaccinated person's immune system acted slightly sluggish and allowed a sporozoite to escape into a liver cell? One sporozoite alone is capable of dividing and releasing into the blood 30 000 merozoites, the parasite's second, asexual stage, which generates the actual malarial symptoms of chills and fever through cyclic invasions and destruction of red blood cells.

Because the sporozoite vaccine may not be totally effective, a second vaccine is being developed, reported Dr Robin F. Anders, Joint Head of the Malarial Team at the Walter and Eliza Hall Medical Research Institute, Vic-

toria, Australia. One handicap in developing this vaccine, said Anders, is that, unlike the sporozoite stage, the asexual stage has demonstrated "a bewildering array of antigens on its surface," including a great deal of interstrain variability. Surface antigens differ even between parasite cells with the same DNA. Somehow the cells are turning on or off different sections of the DNA that codes for antigen protein. "A single clonal line can change its spots, so to speak," explained Dr Anders. Because of this complexity, researchers still have not isolated a single merozoite antigen that could serve alone as an effective vaccine. However, Anders said that his team "does have a number of antigens isolated and, among them, are several

real candidates to use to make vaccine." In the next year they plan to begin monkey experiments to test the immunogenic action of these antigens.

Dr Nossal, director of this institute, cautioned that "a merozoite vaccine won't necessarily stop the disease completely. At the worst, a patient would have a less violent type of disease, maybe a transient headache." He noted that very likely the sporozoite and merozoite stage vaccines would be given in combination for best protection.

How far along is the second vaccine compared to the Nussensweig vaccine? "We'll be field testing in three years, probably," said Nossal. "The end of the decade is not an unrealistic time to expect us to have a ready vaccine. But we're a year or two behind Ruth Nussensweig."

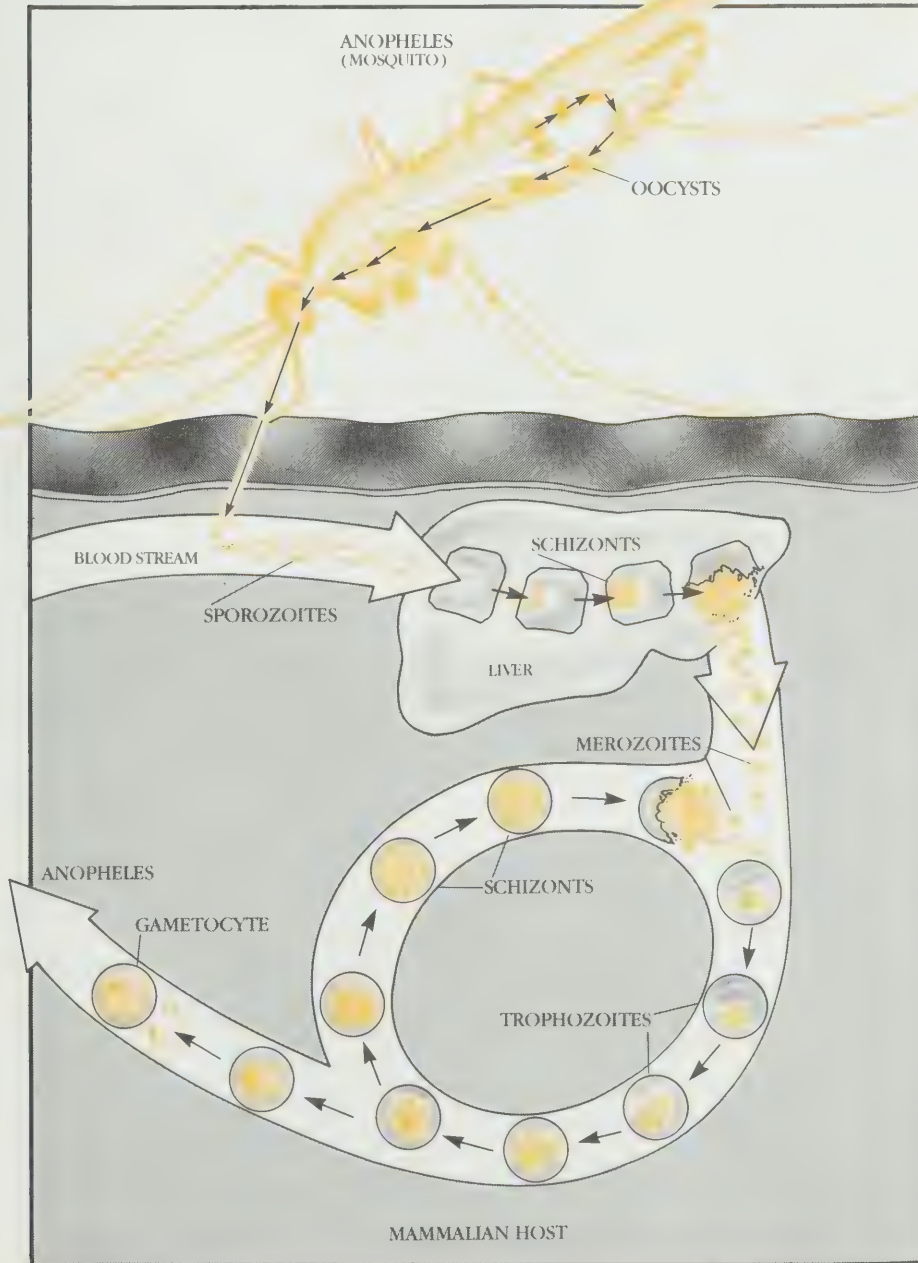
Progress on the development of a third "altruistic" vaccine was reported by Dr Geoffrey Targett of the University of London's School of Hygiene and Tropical Medicine. This vaccine would work against the sexual stage of malaria, transmitted to a mosquito when it feasts on an infected person. "This vaccine won't do the infected person any good," said Targett, "but it will stop transmission of the disease." The amount of antigenic variation in this parasite stage appears to be somewhere between that of the other two stages. Potential immunogenic antigens have been isolated for intensive *in vitro* and *in vivo* testing.

Scientists and health workers at the congress were cautious in their assessment of the potential vaccines because no one knows as yet their final properties, e.g., stability, mode of administration, or length of time they will convey immunity.

Dr Max Miller, congress president, said, "Immunization is the simplest way to prevent disease, but people shouldn't be too optimistic about malaria vaccines." For example, he pointed out, if the vaccines require a "cold chain," constant refrigeration, delivery in the rural tropics could be a major problem. "People are grabbed by the glamour of these vaccines but overlook the fact that unglamorous solutions are responsible for much of the health improvements in undeveloped countries."

In case vaccines are not the dreamed-for success, congress participants presented papers on a variety of other types of malarial control.

In the symposium on malarial chemotherapy and chemoprophylaxis, the session's chairman, Dr W. Peters, Head of Medical Protozoology at the University of London's School of Hygiene





## IDRC JOINS THE BATTLE

With a budget of \$2.6 million for 1984-85, the tropical and infectious diseases program is the second largest area of research supported by IDRC's Health Sciences Division. Over the years, support has been given for research into the etiology (causes), epidemiology (incidence and distribution), diagnosis, treatment, and control of a number of important tropical diseases. These include: schistosomiasis, trypanosomiasis (African and American), leishmaniasis, filariasis (including onchocerciasis), malaria, and leprosy.

IDRC has funded individual research projects on all but two of these diseases. In the case of malaria and leprosy, IDRC support has been channelled through the World Health Organization's Special Programme for Research and Training in Tropical Diseases.

In the area of infectious diseases, IDRC places much emphasis on studies of the etiology, epidemiology, and control of diarrheal disease, which continues to be a major killer of children under five. Research on acute respiratory infections and tuberculosis is also being advanced in all geographical regions. In addition, the growing incidence of the hemorrhagic variety of dengue fever during epidemics, especially in Southeast Asia and the Caribbean, has spawned a number of projects on the epidemiology and diagnosis of this sometimes fatal viral disease.

Within the tropical and infectious diseases program, IDRC is also supporting research into the increasingly serious problem of sexually transmitted disease (STD). At present, many developing countries do not have proper diagnostic and control programs in place. In the case of gonorrhea, the problem has been compounded, in some regions, by the spread of penicillin-resistant strains. IDRC-supported work has therefore focused mainly on the diagnosis and treatment of gonorrhea in Africa, Southeast Asia and, in particular, Latin America.

Finally, the tropical and infectious diseases program is supporting research on vaccines and vaccination programs. Important work in this area has included the development of a time-temperature indicator that allows health workers to tell at a glance whether a vaccine has spoiled or not. IDRC is also funding work on the development of improved yellow fever vaccine in South America and studies on the effectiveness of BCG vaccine for tuberculosis in Kenya, South Korea, India and Brazil.

and Tropical Medicine, stressed the growing problem of drug resistance. In the future, any new antimalarial drug will have to be used in combination with other antimalarials to slow down the development of resistance.

Reports on the geographical distribution of drug resistance showed that chloroquine-resistant *P. falciparum* strains have spread to all continents in the tropics. Cross-resistance to other antimalarials is also growing. In Africa, where a resistant strain was only detected in 1976, the number of malaria cases is increasing dramatically. On the Thailand-Kampuchean border, almost all *falciparum* isolates are resistant to chloroquine and generally Fansidar. In some areas this resistance even extends to quinine. Health workers are forced to treat many cases with the expensive combination of quinine and tetracycline. Thus the offi-



*The face of malaria in Mexico*  
Photo. WHO

cial WHO policy now is to restrict quinine use to keep it effective as a drug of last resort.

There were also disturbing reports from Thailand suggesting pockets of Mefloquine resistance. To delay any further resistance developing to this newest of the licensed antimalarials, health officials now plan to administer Mefloquine only in combination with other drugs, such as the Mefloquine-Fansidar formulation that will be registered by the end of 1984 as "Fansimef." Fortunately, there are no signs as yet of resistance to the still experimental drug halofantrine.

Several speakers urged much closer monitoring of the spread of *falciparum* resistance by using the new, easy-to-use "micro-kits" for detecting parasite resistance to several drugs in the field.

Unfortunately for the goal of malaria control, drug-resistant strains of the parasites are proving to be far harder and faster growing than their sensitive relatives.

The best news was that still newer antimalarials are on the horizon, in-

cluding derivatives of an ancient Chinese herbal medicine that seem to be effective against both *P. falciparum* and *P. vivax*, the milder human parasite responsible for relapsing malaria. Dr T.M. Cosgriff of the US Army's antimalarial drug program reported that the army is also testing 30 compounds that show a great deal of promise. And Dr W.E. Gutteridge of the Wellcome Foundation countered critics asserting that pharmaceutical companies are doing little antimalarial research by reporting on his survey of 16 internationally known companies. Results: eight companies are actively developing new drugs, five of them making final adjustments on specific drugs, such as eliminating side effects, or improving absorption.

In discussion, Dr W.H. Wernsdorfer, Chief of WHO's Malaria Research Unit, warned that the poorer countries will be the hardest hit if drug resistance is allowed to spread unchecked, forcing a shift from treatment with chloroquine to the next lowest-cost drug, which is still five times more expensive.

Later, London's Dr Peters reminded his audience that "it is vital that sole reliance should not be placed on drugs to limit the transmission of the pool of malaria." Instead he recommended more health education, more direct participation of communities in their own control programs, and vaccination.

Among the other methods of malaria control discussed at the congress was the less-human-oriented procedure of vector control. Several papers reported attempts to raise strains of genetically altered mosquitoes that were, for example, more resistant to malarial parasites, but these "pampered, petted" lab-bred strains have proven to be no match reproductively for wild mosquitoes. In general, researchers emphasized the importance of studying the ecology and behaviour of the many *Anopheles* species if there were to be any major gains in future vector control. Scientists are finding that species composition and numbers vary with such practices as forest cutting, urbanization and large-scale irrigation projects, but no one still is sure what really is the critical mosquito density that maintains malarial transmission.

The basis of innate resistance to malaria infections in humans was even probed, but the sessions demonstrated just how much we still have to learn about this ancient disease.

Yet despite the obvious difficulty of the campaign to reduce malaria, at the end of the congress participants were committed to continue. Dr Nossal concluded that "we're talking about a disease that's shaped human history over several million years. If we could eradicate malaria, it would be like killing one of the worst enemies of our species. It might have as much impact as the death of the dinosaurs." □

*Nancy Johnson Smith is a Calgary-based writer and audiovisual consultant.*





Photo: TAP

*Kuala Juru, Malaysia: a cooperative to grow cockles to replace a fishery destroyed by pollution*

## A GROWING FORCE IN DEVELOPMENT

# CONSUMER ACTION IN ASIA

LIBBY BASSETT

**D**evelopment has corroded Malaysia, the Pearl of the Orient. The Pearl's traditional fishermen were among the first victims. An industrial estate with more than 50 factories began, in the early 1970s, to discharge its wastes into their river. The fish died, and so did the livelihood of the fishing community of Kuala Juru.

This is not an unusual story. It happens all over the world. What is unusual is that here, in Penang, Malaysia, a small group of activists from the Consumers' Association of Penang (CAP) worked with the villagers of Kuala Juru to protest their plight — to the government and through the press.

As village leader Pak Salleh said then in 1976, "I am not against progress. I am not against factories coming up. But why is the planning so bad? Why allow the factories to pollute the river? Surely they know our village is here, at the mouth of the river. Surely they know we depend on this river for our survival. We are fishermen. What can we do now?"

What did happen is that the fishermen of Kuala Juru, who had suffered years of common hardship and fought it cooperatively with CAP's help, finally set up a cooperative to grow cockles, a small, edible mollusk that is far more resistant to chemical pollution than fish. Today, working communally, the villagers earn more than they did working individually as fishermen. And, as a gesture of appreciation, the Juru fishermen now contribute the equivalent of five cents from the sale of each gunny sack of cockles to CAP for its help in the past and its continuing relationship with the village. This contribution helps support the consumers' association's rural activities throughout Malaysia.

The multiplier effect of CAP's work goes far beyond its local grassroots. The extraordinary aspect of this consumers' association is that it has spun off people and organizations that now have worldwide impact.

CAP was founded in 1970 with 76 members; now it has thousands. In 1974, one of CAP's cofounders, Anwar Fazal, set up a Regional Office for Asia and the Pacific of the worldwide consumers' coalition, the International Organization of Consumers Union (IOCU). Anwar Fazal now is president of IOCU, the first Third Worlder to hold this position. By 1977, CAP's environmental section had become so involved with national and regional problems that it was decided to start a separate, sister organization focused far beyond Penang. This became Sahabat Alam Malaysia (SAM), or Friends of the Earth Malaysia, one of the most active and feisty environmental groups anywhere.

The primary purpose of all these organizations is to look at development from a people's perspective. Beside protecting people from business malpractice (the usual role of developed-world consumer's organizations), they are involved in issues concerning basic needs: the rational use of resources, environmental pollution, culture, and lifestyles. Their activities include research, publications, educational programs, and media work — in other words, helping poor communities voice and solve their problems. These three small groups put a new wrinkle on the adage, "think globally, act locally," by being so successful locally that they act globally.

The founder, president, guiding spirit and goad of both the Consumers' Association of Penang and Sahabat Alam Malaysia is S.M. Mohd. Idris, described by one admiring Malaysian columnist as "earnest, zealous, dedicated. He is a man who cares, a champion of the little man." Idris is also a successful businessman who, by many accounts, could have concentrated his full time and energy on becoming even more successful.

But Idris says, "Whatever our occupation or our profession, I believe every one of us has social responsibilities. And because of his position, the businessman's are even



greater. Crass materialism is not everything in life. The business sector has a duty to see to it that Malaysia's national resources are not plundered or depleted."

"Equally, the businessman must ensure that we have a sound national economy which is not dependent on others but is able to meet the basic needs of consumers."

Idris is a man who lives and dresses simply. Pinstriped business suits are not his style; he wears either the Indian dhoti or a simple white shirt and trousers. He is filled with a dedication and intensity bordering on desperation, for he feels that development has gone awry in Malaysia and throughout Asia. He looks at the environmental and cultural changes that have so severely affected his people, and although he can take pride in some victories that CAP and SAM have won, he truly feels that the war is being lost, for too many are suffering from badly planned progress.

For example, just outside Penang's capital of Georgetown (named during colonial days when King George III was reigning), is the small fishing village of Tokong Batu. The village was built on a wharf that jutted into the water, but for a year and a half there has been no water. The government decided to build a shore road, and land that was moved "temporarily" during road building has dammed the Strait of Malacca's water, leaving the fishing village high and dry on its jetty. For reasons not fully explained, but probably having to do with lack of funds, work on the road has stopped, and the "temporary" disruption now seems semipermanent. The tidal flow no longer flushes away the village's wastes, and its houses now sit over a stinking swamp of visible and invisible pollution.

This same road project is destroying a ship-building village further along the coast. The government told the shipbuilders they had to get out. For five years they have been told they will be displaced by the road, and increasing pressure has been brought to bear upon them. But they were offered neither a place to go to nor any compensation for the move. CAP has been working with them, trying to give the shipbuilders the will to stay where they are until the government comes up with some kind of compensation.

CAP now has a staff of 68 workers, mostly young people who are a microcosm of Malaysia's multiracial population. Malays, Chinese, and Indians, in Western or national dress, work cooperatively and quietly in a big, open mansion overlooking the Strait of Malacca. They handle an extraordinary range of programs.

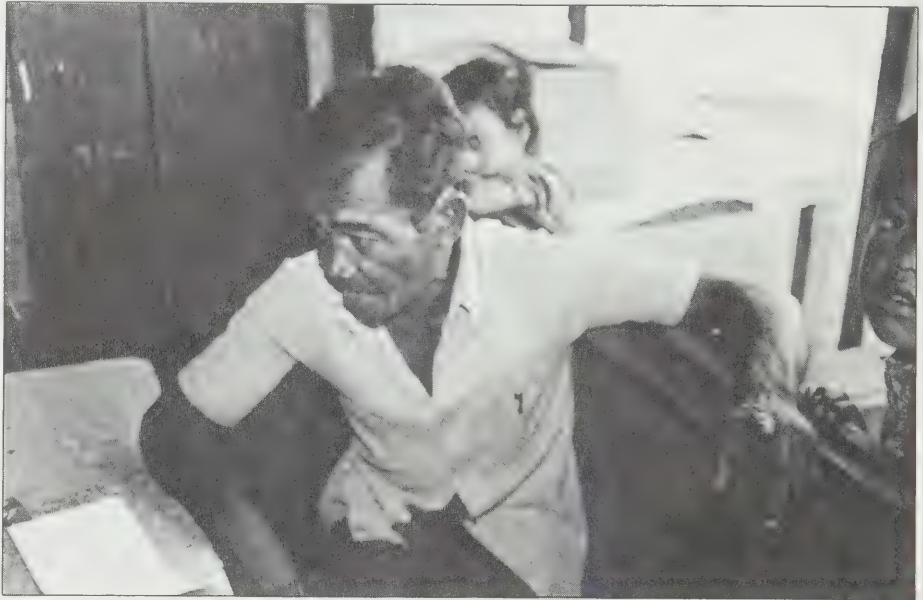
They field complaints, either walk-in or through the mail. In 1972, according to Oxford-educated Research Director Khor Kok Peng, CAP handled 55 complaints; now there are thousands every year. The complaints section "is especially useful for the poorer segments of

the community who are usually not articulate or confident enough to make grievances on their own, and who are certainly not able to afford legal services," he said.

CAP does research surveys and tests local products, ranging from food in the marketplace to textbooks, medical fees, and bus fares. They have found dangerous levels of additives (including banned chemicals) in food and drinks, fish with coliform counts 11 000 times above the safety level, and cosmetics and drugs with illegal dosages

environmental degradation in Malaysia led Mr Idris and some CAP workers to form a separate, nationwide environmental organization, Sahabat Alam Malaysia, or Friends of the Earth Malaysia.

Located in a small house on a quiet residential street not far from the centre of Georgetown, SAM has become the focal point for all environmental information in the Asian region, even though it has just a dozen barefoot workers (it is traditional to remove one's shoes before entering a Malay-



Pak Salleh: "I am not against progress... But why is the planning so bad?" Photo: CAP

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### *Some international consumers' groups are acting locally with effects globally*

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of mercury, cadmium, and lead. They publish their results in the press to alert the public and to pressure the government to establish and enforce safety standards (see sidebar on IDRC support of the CAP research program).

They also publish a wide array of books, pamphlets, and newsletters on subjects as wide-ranging as abuse of women in the media, the effects of television violence on children, rural development and human rights in Southeast Asia, the rising cost of medical fees and "The Malaysian Environment in Crisis." Their environmental research led not only to a book but to a 21-minute colour film, "Crisis in the Malaysian Environment," which won second prize at the Berlin International Consumer Film Festival, competing against 102 other films entered by 16 countries. CAP shot, edited, and completed the film locally at a cost of less than CA\$13 000, a fraction of what it would cost in North America.

The increasing seriousness of en-

sian house, and SAM's office adheres to the tradition).

Last October, SAM organized and hosted a meeting in Penang to discuss "Problems of Development, Environment and the Natural Resource Crisis in Asia-Pacific." It was the first regional meeting bringing together active non-governmental organizations, journalists, and media groups (from as far away as England), academics and representatives of regional United Nations agencies. From this meeting was born the Asia-Pacific People's Environment Network (APPEN), and Sahabat Alam Malaysia was elected to coordinate its work. The 70 participants at the seminar agreed to collect, exchange, and disseminate information not only among themselves but with other groups, networks and UN agencies. And they pledged to confront governments, manufacturers, and industries with information to persuade them to focus more attention on environmental and social issues.

Within Malaysia, SAM has been confronting and goading the government for years. Malaysia's Director-General of Environment, S.T. Sundram, commented recently at a World Environment Centre-sponsored conference in Singapore: "If Sahabat Alam Malaysia were not there, we probably would have to think of inventing it or creating it." However, he went on to criticize SAM for its "emotionalism," lack of objectivi-



ty, credibility, and for not understanding how government agencies work.

Back in Malaysia after the conference, SAM members Rajeandran and Karen Oon disputed the charge that SAM lacks objectivity and credibility. SAM, in conjunction with CAP, relies on university and other experts and on at-the-site research to come up with its data, they said. They freely admitted they use the media to prod the government into action, as local officials in Malaysia are not elected but appointed by the government; therefore, they do not rely on people's votes to stay in power.

One of SAM's more ambitious activities has been to issue a report on the "State of the Malaysian Environment" every year since 1980. The government's 1974 Environmental Quality Act (EQA) mandates that the Director-General of Environment publish an annual report but, since 1976, this has not been done. Therefore, SAM took it upon itself. SAM's 1983-84 report runs 96 pages and pulls no punches. Its introduction says: "Lack of information and noncooperation on the part of the authorities continue to hamper the work of the environmentalists."

The report goes on: "What has been depressing to environmentalists is that there has been no official policy on the environment or conservation," with the exception of the EQA, which SAM characterized as "toothless." SAM continued: "Where planning for so-called development is done, environmental considerations are absent. This is clear when one considers the fact that there is no compulsory environmental impact assessment for development projects in the country."

In both its annual state of the environment report and in its newsletter, SAM began a campaign urging the upgrading of the government's environment division. They recommended making it a separate Ministry with sufficient funds and personnel to do the jobs set out for it.

In the meantime, the fighting Friends of the Earth group in Malaysia continues its research into more than 100 different environment and development issues, gathering information from around the world and disseminating it through a 12-page bimonthly newsletter, a mammoth Environmental News Digest, which summarizes information from publications all over the world, and its new Asian-Pacific Environment newsletter to link the Asian groups that form APPEN.

The Asia-Pacific Regional Office of the International Organization of Consumers Unions — which in some ways grew from the CAP family — has become the nerve center for IOCU's worldwide work. The founder of the regional office, Anwar Fazal, was once Secretary of CAP; now he is President of IOCU and coordinates its 120 members in 50 countries. IOCU has consultative status with several UN agencies, and its job is to speak up for consumers worldwide.

In the late 1970s, for example, IOCU began campaigning on behalf of very new consumers — babies. It worked with other groups to track down and publicize the hard-sell tactics of big infant formula producers, that were contributing to the malnourishment and death of thousands of Third World babies. IOCU and the other organizations worked together to produce a code to control the marketing of breastmilk substitutes. Their code was adopted by the World Health Organization in 1981, the first global consumer code ever.

In 1981, IOCU's Asia-Pacific Regional Office, together with the German Federal Congress of Development Political Action Groups (BUKO), called a conference in Geneva, with UN agencies in attendance, to form a coalition

## CAP AND THE LAW

Consumer protection is in large part vigilance — staying alert to the dangers of abuses of the marketplace, and enacting and enforcing laws to control them. Developing countries have not built up a body of consumer law because they lack the resources to keep pace with the rapidly changing market.

Aggressive consumer groups such as CAP can play a critical role in pushing forward consumer protection by identifying — from the nature and number of complaints they receive — where laws should be created, reformed, expanded, or even enforced more vigorously.

In 1983, CAP proposed a project to IDRC for the preparation of a series of memoranda to the Malaysian government on the legal aspects of consumers' problems that would assist legislators to cope with the need for consumer protection. At the same time, CAP would provide information to the practising bar, law teachers, and the public (through the media) to make them more aware and vigilant of consumer problems. In the context of the project, law students working with CAP would have the opportunity to become familiar with consumer law.

The first of the memoranda concerned malpractices in the commodities future trading industry that have cost small investors their savings. Others have identified false advertising practices, the need for legislation to control the disposal of toxic industrial waste, and the threat posed by pesticide contamination of the food chain and the poisoning of the water and soil.

A second project, now underway with IDRC support, is examining in detail the way pharmaceuticals are marketed in Malaysia to determine if there are abuses of pricing, inappropriate prescribing or inadequate warnings concerning adverse reactions.

to counteract the unethical sale of pharmaceuticals in Third World countries.

The coalition that came out of that meeting, Health Action International (HAI), is made up of development groups from 40 countries, groups such as Oxfam in England, the US Interfaith Center on Corporate Responsibility, the People's Health Centre of Bangladesh and, of course, the Consumers' Association of Penang.

HAI aims to promote the safe, rational and economic use of pharmaceuticals worldwide and to stop the dumping of dangerous drugs on developing countries.

The following year, 1982, saw the formation of the Pesticide Action Network (PAN), again organized by IOCU's regional office in Penang, this time with Sahabat Alam Malaysia (SAM). At that first meeting, 39 participants from 16 countries launched a campaign to stop the widespread, inappropriate sale and use of pesticides. Among PAN's founders were Oxfam, the Environment Liaison Centre of Kenya, Consumers Union of Japan, Berne Declaration Group from Switzerland, and the Institute for Food and Development Policy (publisher of the hard-hitting exposé on pesticides, *Circle of Poison*).

Less than two years later, in February 1984, when PAN held its first "global meeting" in the Hague with Dutch government support, it had expanded to encompass more than 300 environmental, consumer, religious, development, labour and agricultural organizations from 49 countries on every continent. Now called PAN International, it has set up a system of task forces and centres to coordinate research and action. At that meeting, PAN members were able to take credit for playing an active role in the successful passage of resolutions on pesticides through both the UN General Assembly and the European Parliament. This work has continued with the Organization for Economic Cooperation and Development (OECD) and other international organizations.

With the growth of the Consumers' Association of Penang, the start-up of the international consumers' organization regional office by a CAP officer, and the now regional and often international Malaysian environmental organization, Sahabat Alam Malaysia, this small island's activists now have international impact. The Malay word for Penang is Pulau Pinang; betel tree. From this small beginning has grown multibranched organizations that work worldwide for a better, safer, healthier life for millions. □

*Libby Basset is Director, Publications and Communications, World Environment Center. For more information: Consumers' Association of Penang, 27 Kalawei Road, Penang, Malaysia; International Organization of Consumers Union, Regional Office for Asia and the Pacific, P.O. Box 1045, Penang, Malaysia; Sahabat Alam Malaysia, 37, Lorong Birch, Penang, Malaysia.*



# SPEAKING SCIENCE

AN INTERVIEW WITH  
DR ABDULLAH AL-MUTI SHARAFUDDIN

**Reports:** How did science and Bengali become linked?

**Sharafuddin:** Ever since the British left the subcontinent in 1947, our people had been demanding that their language, Bengali, should be made a state language. But the administration of the day had different ideas, and for that simple demand, on 21 February 1952, several students and others taking part in a demonstration in Dhaka had to lay down their lives. This sacrifice, and many others subsequently, did not go in vain. The language movement ultimately led to a massive national liberation move-

ment. Thus Bangladesh, with more than 90 million people, practically all speaking the same tongue, is today a sovereign state and Bengali is our state language.

I was a university student in those days and, along with many others, took direct part in the language movement — was even thrown in jail for almost a year. We are glad that our people finally won the right to use their language in national affairs. This movement was one of the factors that inspired some of us to begin writing extensively on science and technology in our own

language. We felt that language is a vehicle not only for conveying emotions and feelings through poems and other forms of literature, of which we have a rather rich tradition, but that science and technology, which are the main instruments for moulding the lives of the people today, have an equal claim on language. This communication, moreover, should be at various levels — as the mother tongue should be used as a medium of instruction at different stages of formal education, there must be adequate literature to communicate science and technology to the lay people.

**Reports:** And what approach do you take creating this literature? Would it be your work goes beyond books?

**Sharafuddin:** I write in a language that is more or less a spoken language; I mean, most people cannot distinguish between my writing and my speech. I don't just simply write, but I try to plan a book with all kinds of special effects.

What I mean is I have given attention to pictorial presentation of the scientific principles, not in a stilted scientific fashion, but in a popular fashion that would appeal to the imagination of youngsters and adults. And also, my style has been such that it is a very simple language. I always start with very basic principles in a manner not taking anything for granted. Normally, scientists write for scientists and it becomes difficult for the scientist to write for the layperson. But I take nothing for granted, I assume that my readers are all like children. Many of my articles for example, have been presented in childrens' groups and, therefore I have tried to combine talking and reading and writing together.

**Reports:** Do you find the Bangali language able to cope with scientific and technological terminology?

**Sharafuddin:** Now my feeling is that our

language is constructed in a way such that many abstract ideas can be conveyed. The deficiency has been in terms of technological language.

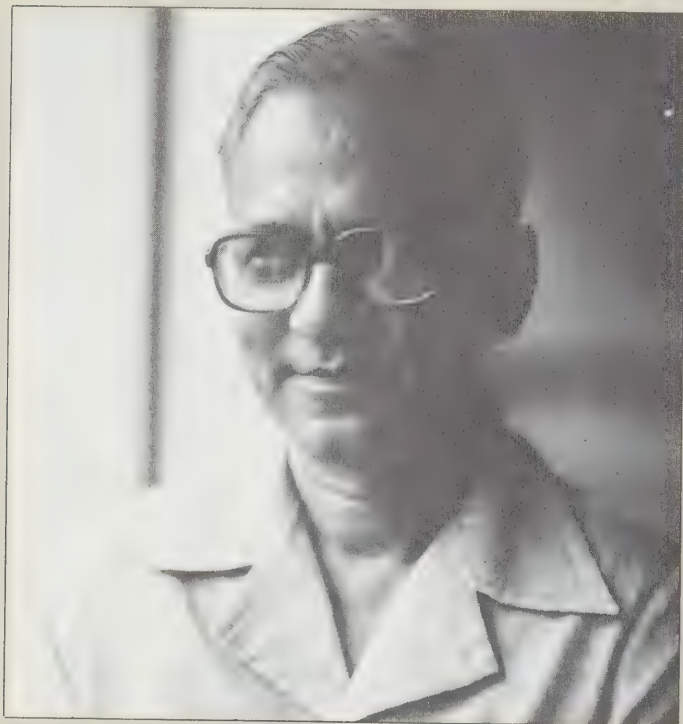
We have a scientific literature created by non-scientists, where powerful writers have tried writing about science. What is surprising is that our scientists have not come out themselves communicating in such large numbers. Scientists become proficient in English as they become proficient in their formulas and other things... scientific subjects... and they feel comfortable in communicating in English.

Then we have another stream of writers who are proficient in the Bengali language, but concentrate their language skills on poetry, short stories and novels, and so on, of all various emotional aspects and not about practical things. We have these rich divergencies. What I have tried to do is combine the streams: I mean, richness of the Bengali language and my study of the Bengali literature and whatever acquaintance that I have with our modern writers and my acquaintance with scientists of our present day. I try to combine, to put it together for the layperson, and particularly for the younger generation.

**Reports:** Do you perceive any changes, any results from this sort of communication?

**Sharafuddin:** I think so. But of course I cannot say that the changes are taking place because of my effort alone. There are various factors converging. But there has been quite a change in the notion about science and about the world itself. I will give you a good example: when I was a student in university, we had only one university and we had about 1600 students.

There were few science students there at that time. Now in all universities we have about 40 000 students instead of 1600, 40 years later. Out of these 40 000 students, 40



*Dr Abdullah Al-Muti Sharafuddin, Secretary of the Science and Technology Division in the Ministry of Education in Bangladesh, has been communicating on science for more than 40 years. In 1983, his efforts to promote "science literacy" in Bangladesh were recognized by UNESCO, which awarded him the Kalinga Prize. Dr Sharafuddin's concern has been to imbed science in Bangladeshi culture using the most sensitive of tools — language. Chin Saik Yoon, IDRC Communications Division Regional Liaison Officer for Asia spoke with Dr Sharafuddin recently in Bangladesh.*



percent are now in science and technology, which means 16 000 students are in science. The very fact that 40 percent of today's students have come into science and technology is quite a change from my days, when the number of students was very small compared to the population and the proportion of students studying science was smaller still. And not only is there a great urge for studying science today but also the proportion of girls among the science students is increasing. I mean, girls and boys are coming in equal proportion, and the best students of both genders are taking up science and technology.

I cannot say that we have been entirely successful so far in introducing Bengali as medium of instruction at the higher stages of education. But we are delighted to note that among the younger generation there is a growing inclination to go in for studies in science and technology. In my own school days, in the early 1940s, we had practically no science in school. Since 1960 all students have to take science as a compulsory subject in secondary schools.

The number of workers in R & D has been showing a corresponding increase. In 1960 we did not have any science laboratory worth that name outside of the universities. Now we have about 60 R & D institutions throughout the country working on problems of national importance.

More than being a subject of study as an academic discipline, among a growing segment of the younger generation science and technology are today being considered a part of the general culture and an absorbing object of recreational interest. For example, I think that it was in 1973 or 1974, the first few science clubs started coming up in some schools and colleges and even in some other venues. Now we have about 450 science clubs

throughout the country. Mostly, the members are young people — school students, college students — and they are involving their teachers: college teachers, university teachers and even agricultural specialists and medical specialists. And since 1978, when we started organizing the National Science Week, the science clubs started participating.

All the science clubs would undertake some projects. There were competitions and projects. There were competitions in public speaking on science. Now this is becoming more and more popular. Every year, at least 30 000 people are becoming involved or members of science clubs

doctor; or when we have to build a bridge or a house, we find engineers; or somebody has to have a job and therefore needs a skill. But science is a way of thinking. Life is becoming so complex with problems of ecology and population, and food production — none of these problems can be solved unless everybody in the country becomes scientifically literate and has some understanding of the implications of the times — the benefits of science as well as its dangers. And therefore, in order to bring about this cultural change — a cultural revolution, even — we have to have a scientific awareness among the whole population.

physics society, chemical society, environment society, and all kinds. We are working on science and culture combinations — social organizations that have a component of science. We tend to support them also. And we hope that through their activities, there will be better communication between the scientists, leaders in culture and communication and the average person.

And certainly, we hope to have more publications on science. We have been trying, for example, to set up a national science library. Presently this is a national depository of various sophisticated science books, especially reference books. But as part of the function, we hope that it will also start publishing popular books on science. They have not started doing this yet, but we hope that they will undertake to publish books, textbooks, and other reference books for school students and college students.

At the moment, maybe 20 or 30 books annually come out in a popular science mode. We hope this number will be increased. Every year, Bangladesh now produces maybe 2000 books of various kinds. Most of them are standard books, some of them are perhaps trash, but we probably have not more than 20 on science. This is a very small number indeed. We hope this number will increase and we think it can be done only by creating a cadre of people, scientists and science communicators.

As I said, due to all of these efforts, we now do have the beginnings: a group of people who are writing for the journals, for the newspapers, who are writing books. We hope that of course this will have a snowballing effect. In the beginning, when there is only one or two persons, it is very difficult. But when you have a group of maybe 20 or 30 it is easier; when you have a few hundred it is easier still. We hope that this will accelerate science literacy in the coming years.



*Some of Dr Sharafuddin's numerous publications*

— attendance has grown, and we have started having science fairs, about 460 now, all across the country. These things indicate that science is gradually getting into the lives of the young people and the average person as well.

**Reports:** So looking ahead, what role do you see science communications playing?

**Sharafuddin:** Well, I think that science has to find a place in the culture of the country as a whole. For example, we accept sports and games as a part of the culture. Music and dance is a part of the culture. Literature is a part of the culture. Religion is a part of the culture.

Previously, we have been looking at science as a technical device — as an instrument only. When we are sick we need the

And what we are trying to do now is encourage more of our newspapers to have scientific features. We have features on economic problems, we have features on literature, we have a woman's page, we have a cinema page. We have all kinds of pages but we don't have a page on science yet. We are going to try to persuade newspapers to start a science corner or a science feature or a science page.

We have a number of science journals: some are monthly, some quarterly. This ministry is trying to patronize these science journals through monthly grants — only a token really — to support and supplement and encourage indigenous publishing.

And, also we are encouraging all kinds of scientific societies:





# AN END TO BENDING

## THE MECHANICAL SOYBEAN SEEDER

**S**oybean farmers in rural Thailand may never hear of the Bangkok-based Asian Institute of Technology (AIT), but it is an AIT-developed mechanical seeder that could vastly improve dry season planting on the country's soybean farms.

Soybean is grown during two seasons in Thailand: the rainy season and the dry season. In the rainy season, soybean is planted in the prepared fields and its growth and yield depends on the rains; the same rains, however, may cause considerable damage to the crop if they are heavy during the harvest period. Dry season soybean is planted in the stubble of the rice crop, in order to take advantage of residual soil moisture, and only in irrigated areas where farmers can maintain soil moisture at the desired level. The stubble provides a simple guide to sowing density (about 200 000 seed 'hills' per hectare) and allows the soybean roots to penetrate the soil by following the decomposing rice roots. It is also thought that the decomposing rice roots provide an additional source of nutrients.

Although the major portion of the total production of soybean comes from the rainy season soybean, dry season soybean is considered more desirable because of its higher yield and better quality. One of the factors limiting the production of dry season soybean is the manner in which it is planted. Unlike rainy season soybean, which is planted in furrows opened by tractor or animal-drawn implements, dry season soybean is planted by hand in a 3-person operation. The first person makes holes with a pointed wooden stick; a second bends or squats to drop 3-4 seeds into a hole, and a third covers the holes with earth, ashes, or pig manure. The work is tedious, time-consuming, and exhausting. Moreover, because of the simultaneous demand for labour for the rice harvest and for soybean seeding, far-

mers sometimes resort to broadcasting the seed. Broadcast seeding is quicker, but produces less uniform seeding and lower germination rates — and subsequently, lower yields. For these reasons, soybean production in Thailand has actually declined, despite the fact that the area of land under soybean cultivation has substantially increased in recent years.

In order to reverse this trend, scientists at AIT developed a prototype seeder that combines hole-making and seeding into one operation. The device allows the labourer to work in an upright position, making planting a

considerably less tiresome, less time-consuming, and less labour-intensive operation. The seeder consists of a 1 1/2 metre steel tube, in which the seeds are stored, and an outer tube equipped with a wedge-shape tip and attached by a spring to a rolling metering device. When the seeder's tip is pushed into the ground, the spring is compressed, activating the metering device which releases 3-4 seeds into the hole.

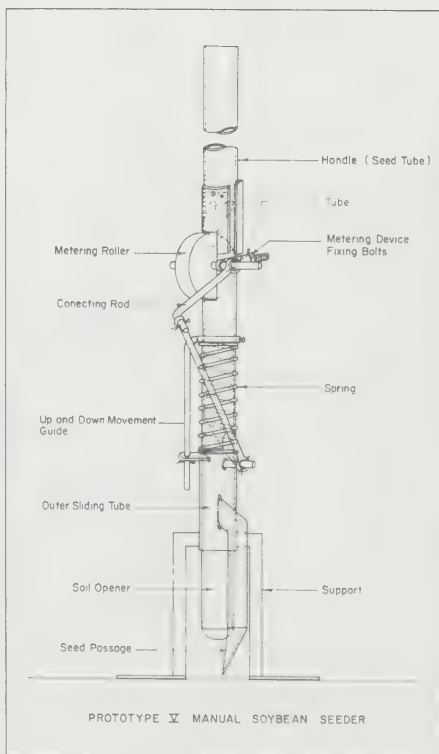
With a grant from IDRC, researchers have improved the seeder's design to eliminate such problems as seed breakage, seed jamming, and soil clogging. Through the substitution of lighter materials, the seeder's weight was reduced from 3.2 kg to approximately 1.5 kg. To suit different soil conditions, two versions of the seeder were designed: a blunt-tipped seeder for wet (or irrigated) soil and a sharper-tipped seeder for dry soil. A stand was added to keep the delivery tube from coming into contact with the soil and clogging up, a particularly important feature for dry season planting.

In tests conducted by AIT, the seeder cut sowing time by half from 46 person days to 22 person days per hectare. Since the seeder costs approximately US\$10.00 (including labour, materials, and mark-up), the farmer can expect to recuperate the cost, in terms of labour saved, in only 5 days, and with as little as one-fifth of a hectare under cultivation. Mass production is expected to reduce the cost of the seeder even further.

In Thailand's northern province of Chiang Mai, the idea has already caught on: a number of local manufacturers have gone ahead with small-scale production of mechanical seeders based on the AIT model. Under a new grant from IDRC, detailed blueprints of the seeder as well as training in the AIT manufacturing technique will be supplied to the manufacturers. Also, field demonstrations on different crops in different areas will be carried out to familiarize farmers with the seeder's operation.

By making planting a less onerous and more systematic operation, the soybean seeder is expected to increase crop productivity, making more of the world's richest source of plant protein available in the developing world. □

*Teresita M. Padilla is information services officer at AIT, Bangkok.*





**B**amboo is the fastest growing and most versatile plant in the world. It can stretch to a maximum of about 37 metres (120 feet) high and 30 centimetres (a foot) in thickness within a period of only two months. Reaching full maturity in one year, bamboo has been reported to grow more than a metre (four feet) in a single day.

As the most important forest product after timber in South and Southeast Asia, bamboo and rattan play an integral role in the lives of rural people and the economy. These giant grass-like plants are used in everything from house construction, scaffolding, ladders, mats, baskets, fencing, tools, utensils and furniture to food, fuel, and even paper. The interlocked roots of a bamboo grove prevent soil erosion and minimize damage from floods and earthquakes.

Although the two plants have been exploited and used for centuries, surprisingly little scientific research has been done on them until recently. Relegated to the status of "minor forest product," they have been the most neglected natural resources in Southeast Asia. Dependence on traditional methods of production, disappearance of large tracts of forest areas, and uncontrollable exploitation have depleted bamboo and rattan stock in some areas and have hindered the industry's socioeconomic development potential.

To help the rattan industry, a few producing countries, including India, Indonesia, Thailand, Malaysia, and the Philippines, have started in recent years to research the silviculture and utilization of rattan. Presently, the greatest proportion of the production comes from plants growing in natural forests. The rattan industry remains very much a part of village or rural life.

Ninety percent of the world's demand for rattan is met by Indonesia, the rest coming from other producing countries of Asia and a little from Africa. Hong Kong and Singapore dominate the rattan trade scene, but do not grow the produce themselves. It is estimated that half a million people in Southeast Asia are directly employed in cultivation, extraction, processing, and cottage-scale manufacturing of rattan. Trade in raw canes amounts to about CA\$65 million; by the time the manufactured product reaches the consumer, its value is increased to about CA\$1.6 billion — a great potential for earning foreign exchange.

However, according to a recent research report, agricultural development, overexploitation, greater exploitation of immature canes, and a preference for a certain species are all diminishing supplies. Demand for rattan has usually remained constant, but in the past few years demand has outstripped supply.

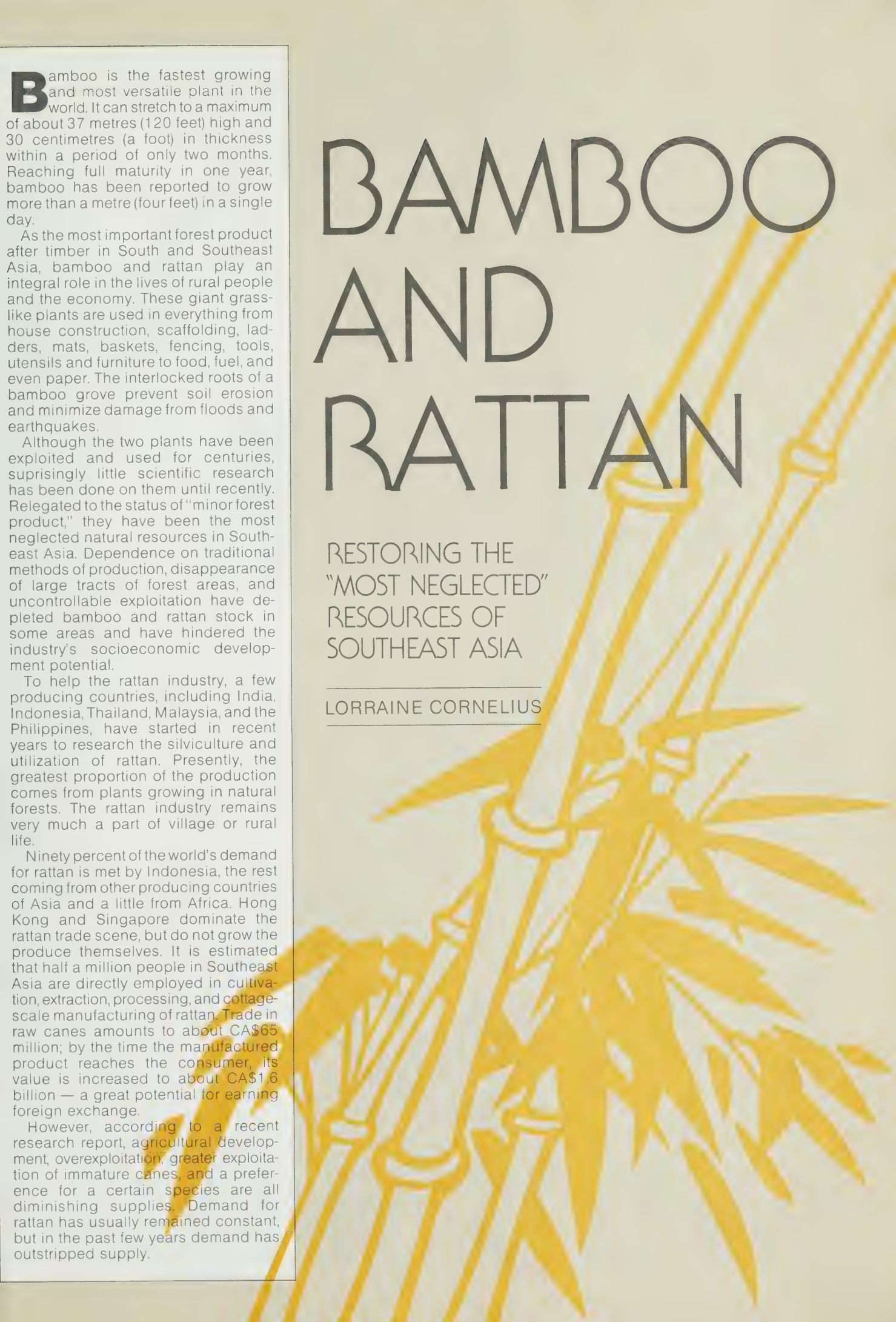
# BAMBOO AND RATTAN

RESTORING THE  
"MOST NEGLECTED"  
RESOURCES OF  
SOUTHEAST ASIA

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LORRAINE CORNELIUS

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IDRC was first made aware of the problems of the industry after it received an inquiry from Malaysia about the possibility of financing a research project on rattan. It became evident that very little information about rattan existed in any organized fashion. In June, 1979, specialists from seven Asian countries concerned with the production of rattan attended a workshop in Singapore. From this meeting developed the establishment of an information centre on rattan at the Forest Research Institute (FRI) in Malaysia.

The centre, which is supported by IDRC, collects, classifies, and stores all relevant information on rattan and disseminates this material to users. Also, reviews and manuals on special topics are published as well as a directory on ongoing research projects on rattan in the region. This is updated regularly in a quarterly newsletter on rattan. Researchers involved in the centre believe that, with easier access to information, the rattan industry will continue to grow.

In order to improve tropical forestry research in developing countries, IDRC and the International Union of Forestry Research Organizations (IUFRO) conducted a workshop on bamboo research in Asia in 1980. The main objectives were to review existing research on bamboo production, to consider constraints preventing greater use of bamboo and to identify regional research priorities on bamboo cultivation and management. Several research projects are now underway in various countries as a result of the workshop's findings.

Of the more than 10 million tonnes of bamboo produced annually in the world, an estimated 3.5 million tonnes are grown yearly in China. There are more than 300 species of bamboo found in 22 provinces and are mainly distributed on the plains, hills, and mountains at altitudes below 3000 metres.

China has conducted independent research on propagation methods of bamboo, disease and pest control and processing. But according to 1981 statistics, China is producing only about half of the national demand for bamboo and there is an urgent need to replenish the stock.

A bamboo research centre was recently established at the Sub-Trop-

ical Forest Research Institute in Zhejiang Province, one of the major bamboo growing areas of the country. Supported by IDRC, the centre has embarked on a project to increase the production of bamboo in China by more intensive cultivation of natural bamboo stands and by selecting high-yielding bamboo species of good quality. A special survey of fast-growing and cold-resistant species of economic value is being conducted. Attempts are also being made to determine the nutritive value of edible bamboo shoots and to control their quantity and quality.

A similar IDRC-sponsored project is underway in Thailand, but involving research of species and agroclimatic conditions very much different from those in China. Conducted by the research staff of the Royal Forest Department and Kasetsart University's Faculty of Forestry, the study will introduce new species of bamboo and will develop improved silvicultural management methods for natural bamboo stands and cultivated plantations.

Most bamboo shoots, which are an important daily food for Thai people, are collected in the natural forests. This extraction is rarely controlled by any authority and is the main cause of the plant's depletion. The research project is attempting to establish a controlled system of planting in many areas of the country using a variety of edible bamboo species in order to preserve the natural regeneration of bamboo stands.

Several farmers and small land-

holders, eager to take advantage of the supply and demand theory, want to grow bamboo clumps on their own land to earn extra income selling culms and shoots as cash crop. Through the development of seed collection and storage methods, farmers may be supplied with seeds and seedlings on a much wider scale than is presently possible.

#### TISSUE CULTURE

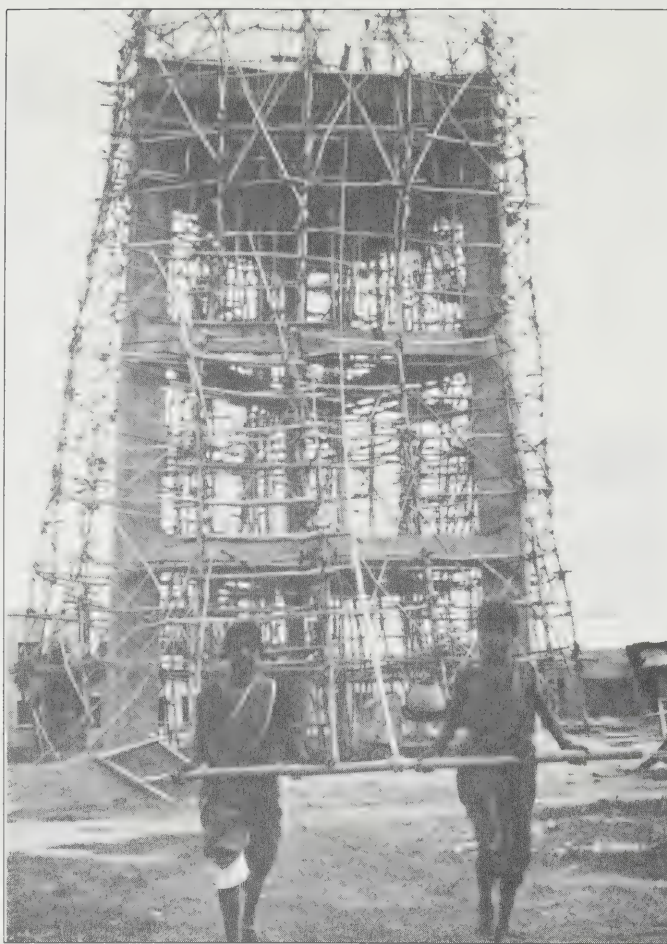
Overexploitation, leading to a scarcity of mature seed-bearing canes, has threatened the rattan industry in Malaysia — and the estimated 50 000 aborigines and villagers that depend on it. In order to ensure there will be stock to plant in the future, the Forest Research Institute and Ministry of Primary Industries are cooperating

in an IDRC-supported project to generate rattan from individual plant cells through tissue culture. The method chosen, the callus method, involves placing cells from a piece of tissue — taken from root tips, shoot tips, or other parts of the plant — in a hormonal solution that induces them to grow and divide into a callus or undifferentiated mass of cells. The callus is then placed in another hormone-and-nutrient bath that induces differentiation of roots and shoots, from which complete plants can be grown. The process is successful because individual plant cells are said to have totipotential, that is, the genetic capability of structuring the regrowth of the whole plant.

In spite of its many excellent properties, the natural durability of bamboo is generally low. Depending on how it is used, untreated bamboo may last fewer than one to three years when exposed to the elements. Under cover, it may have a life expectancy of four to seven years. Bamboo is susceptible to attack by fungi and insects such as beetles and termites, which are attracted to the high starch level in the culms.

The traditional method of preservation used by rural people in Indonesia and other Asian countries is to soak the bamboo in water in order to reduce the starch content. It has not yet been proven whether this system improves resistance to attack.

An estimated 3.3 million tonnes of bamboo are demanded annually in Indonesia; 80 percent is used in construction. Culms are relatively



*Bamboo scaffolding: one of a multitude of uses*



inexpensive but the cost of repair or replacement, especially of bamboo houses, is substantial. Prolonging the life of bamboo structures and preventing decay are important procedures for rural people.

With the support of IDRC, the Faculty of Forestry at Gadjah Mada University, Indonesia, has undertaken a project to test whether or not the traditional methods of preserving bamboo are the most effective for increasing the durability of bamboo for various construction purposes.

Although most Asian countries have a variety of different rattan and bamboo species, only a small number of them are used widely. In Sri Lanka, only five out of fourteen species are used extensively for scaffolding, rural housing, handicrafts, and supports for bean vines. Little attempt has been made to cultivate the economically important species on a large scale. Demand for bamboo and rattan products now exceeds supply and this will have serious employment and economic consequences for the rural people.

The Forest Department, within the Ministry of Lands and Land Development, has recently received a three-year grant from IDRC to conduct a project with a goal of increasing the available sources of raw material and the supplies of bamboo and rattan to cottage industries. The Department plans to undertake trial plantings of native and exotic species, to improve nursery stock and seed storage, and to introduce better management methods.

#### BAMBOO IN BANGLADESH

The most extensive bamboo research project is taking place in one of the world's least-developed countries — Bangladesh. The population of 92 million uses 10 million tonnes of bamboo annually, most of it for the construction of rural housing. The livelihood of many people depends on the production and sale of bamboo articles. The recent scarcity of bamboo and consequent price increases have affected house building and various cottage industries, particularly in rural areas.

In August 1980, the government's Forest Research Institute (FRI) began the first stage of a two-phase project supported by IDRC that aims at increasing the supply of high quality bamboo in village and state forest. Also during this first phase, staff was trained to administer bamboo research. Degrees at the MSc level were obtained by two researchers in bamboo taxonomy and tissue culture. There is now a group of four qualified researchers at the FRI to conduct practical research to increase the production of bamboo in Bangladesh.

The second phase of this ambitious project began in the summer of 1984. In addition to continuing research initiated earlier, studies focus on the effect of chemical fertilizers on commercially important bamboo species. Experiments are being conducted to

determine whether the time required to form a natural clump can be reduced by fertilizer application.

In order to train rural people about better cultivation and management of bamboo groves, demonstration trials providing technical expertise are being set up in selected villages. In the first year, two villages in the Chittagong and Chittagong Hill Tract districts were chosen. Four more villages in different parts of the country will participate in the second and third years of the project, for a total of ten villages. A manual for the cultivation and management of village bamboo groves will be prepared and distributed to the villagers.

The status of bamboo and rattan as

forest products has improved significantly since research on the plants began in the 1970s. Although more studies are needed in all levels of production, much has been gained by the scientific community's recognition of bamboo and rattan as two of South-east Asia's most valuable natural resources. Knowledge resulting from ongoing research projects will have a positive impact on the economies of developing countries and rural people, in particular, can look forward to depending on a steady supply of bamboo and rattan — crucial materials in their daily lives. □

*Lorraine Cornelius is an Ottawa-based writer and audiovisual consultant.*

## A NOBLE GRASS

Bamboo is a member of the grass family but is categorized in the sub-family named *Bambusaceae*. It is characterized by the woody and hollow stalk, or culm, and a complex rhizome (root-shoot) system. Culms are divided by walled septa, or nodes, which give the plant its strength. Ancient folklore refers to the smooth expanse between nodes as representing virtue, and the hollow interior symbolizes modesty and humility. The light, stiff, and strong culms are what make bamboo so valuable.

In all types of bamboo (there are over 1000 species of some 50 genera), the most striking characteristic is immense vitality. With its far-ranging network of rhizomes beneath the ground, all shoots are linked together, nourish each other and propagate without attention.

There are two main types of bamboo — monopodial and sympodial. The first, usually found in cooler or temperate zones, is described as a runner bamboo that sends its rhizomes in all directions.

Sympodial, or clump forming bamboo, is widespread in the tropics. Clump types multiply symmetrically outward in a circle. The rhizome puts forth an underground shoot, but this is connected directly

to the parent and the link is short.

Bamboo's most fascinating and mysterious feature is its flowering cycle. Depending on the species, flowering occurs every 60 to 120 years, perhaps only once in several human generations, and then most plants die. Flowering is spread over a year or two and is gregarious in nature. Every bamboo of the same species, even if planted in different countries, will flower simultaneously. This phenomenon indicates the common origin of bamboos and the strength of the genus.

The bamboo dies after flowering because the old leaves fall and, instead of being followed by new ones, are generally replaced by flowers. This prevents the bamboo from taking in water and nourishment and, deprived of strength, it perishes. Although the culm dies, the grove survives because some of the rhizomes live on. This is the only time when the plant can extend its growth sexually and during this period seeds are produced and take root.

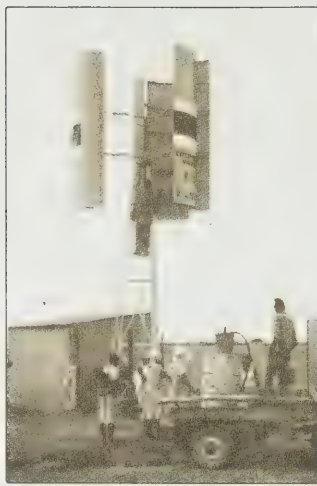
It could take over 10 years for the next family of culms to reach the size of the previous generation, if the bamboo grove is left without proper attention. A large number of bamboos flowering simultaneously may have serious economic implications, because death of the bamboos deprives the people of a precious natural resource. Many bamboo research projects currently underway are studying ways to restore bamboo production as soon as possible after flowering.

In China's Sichuan Province, one particular species, the arrow bamboo, has reached the point in its century-long life cycle where it is now flowering and dying en masse. The depletion of this valuable food source is having disastrous consequences on the rare giant panda population, which totals no more than a thousand.





*Experimental  
Filippini rotor  
rigged to pump  
water in  
Botswana:  
cheaper than  
diesel but  
vulnerable*  
Photo: Richard  
Carothers



# THE FILIPPINI WIND PUMP

RICHARD CAROTHERS

Over the past several years there has been considerable interest throughout the Third World in developing reliable water pumping systems that can make use of locally available energy sources. Solar, wind and biogas energies are all possible options, but of these, wind has the oldest history. Although the use of wind energy has declined from its time of peak importance for both economic and technical reasons, the changing economic climate, vis-a-vis energy costs, has created a possibility for a new era in wind energy.

## DEVELOPMENTS IN ETHIOPIA

Interest in wind energy has spawned a number of programs in many developing regions of the world. Those focusing on the development of wind pumping equipment have tried to produce systems that could be manufactured without the need for sophisticated production facilities and yet provide reliable water supplies at low cost. It was in this context that the Filippini rotor was first developed in Ethiopia during the early part of the 1970s. As an additional member in the family of vertical-axis wind rotors, it had three blades each of which included a semicircular leading edge bucket followed by a curved splitter plate. The new rotor had the self-starting characteristics of other high-solidity vertical-axis rotors such as the more familiar Savonius design, but operated with a higher efficiency. The relatively simple concept did not require sophisticated manufacturing techniques and therefore appeared to be well suited for construction in small workshops.

Some of these windmills were produced and installed at village wells in Ethiopia and later in Somalia as well. While there was interest in further expanding their use, performance measurements of the Filippini rotor were carried out first to see how it would compare with other types of wind rotors. IDRC supported a study at the University of Waterloo in Canada

where a low-speed wind tunnel and other research facilities were available.

In order to maintain the basic simplicity of design and ease of manufacture, the Filippini rotor was not modified in an attempt to improve performance. Rather, the University of Waterloo was to test the rotor as specified by Ethiopia and then to compare its performance with other existing windmill types.

Both wind tunnel models and a full-scale rotor were used in the course of the testing program. The results showed that the Filippini rotor could capture about 25 percent of the available energy in the wind compared with only 15 percent for the Savonius rotor. The Filippini rotor produced its peak power output at a tip speed ratio (rotor tip speed/wind speed) just under 1 and was therefore assumed to be operating primarily as a differential drag device (one in which the drag on one side was greater, causing rotation). However, the detailed flow patterns around the rotor were not completely understood and this complicated the design of a high-wind protection system to protect the rotor against forces exerted by high winds.

Although no final high-wind protection system was developed, it was suggested that a system of spoilers might be used to slow the rotor during periods of high wind and thereby prevent structural damage from centrifugal loading.

The Filippini rotor was not as efficient as the conventional "American farm" windmills, but it seemed to have a number of advantages in addition to ease of construction. As a vertical-axis rotor, it would not have to be oriented into wind. It also had a relatively simple transmission, especially if matched with rotary drive pumps, as well as a higher efficiency than other high-solidity, vertical-axis rotors. There was still the problem of protecting the rotor in times of high wind, but researchers thought this could be solved by making the rotor sufficiently robust. This appeared

to be practical for the relatively small (2m x 2m) rotors used in Ethiopia.

Botswana obtains much of its water from bore holes using rotary drive mono pumps powered by diesel engines. The mono pumps recently gained wide acceptance because of their reliability, but the diesel engines proved to be unsatisfactory. Faced with higher operating costs and frequent maintenance problems for the diesel engines, the Government of Botswana began to look for other means of pumping water. The suitability of the Filippini rotor for operating the rotary-drive mono pumps made it an option worth considering. But it was not clear whether wind pumps could offer a viable alternative to diesel pumps, nor whether the Filippini rotor, coupled with a mono pump, would be preferable to conventional windmill designs. IDRC funded a field testing program with the Rural Industries Innovations Centre in Botswana to examine these questions. From the results of the Waterloo study estimates were made for the appropriate size of rotors that would meet typical domestic water demands for small rural communities. These would have to be 4m x 4m in cross section — significantly larger than those used in Ethiopia.

## HIGH WIND PROBLEMS

Realizing that the high wind problems would be more severe for this scale of rotor, a 1:4 scale model was built and used to test the proposed high-wind protection systems. Spoilers were found ineffective in that they did not produce a significant reduction in the tip speed ratio and they increased the overall profile drag (drag produced by the shape and size of the rotors). Flaps attached to the leading edge bucket gave a further reduction in rotational speed, but also increased the profile drag. As a result, neither of these systems were used. The rotors were instead designed simply to withstand the centrifugal forces and profile





*Filippini configuration showing leading edge bucket followed by curved splitter plate*

drag loading that was expected and would continue to operate during high winds.

Two 4m x 4m Filippini rotors were built in Botswana and coupled to a variety of pumps, although the mono pump remained the preferred choice. These were used for domestic water supply and livestock watering. The transmission used included a double or triple stage belt drive and, in one case, a mechanical clutch. The clutch allowed the rotor to start unloaded and use its rotational inertia to overcome the high starting torque that is characteristic of the mono pump. This allowed for about a 30 percent increase in output while maintaining similar low-wind start-up characteristics. However, the clutch created a variety of main-

tenance problems and was not considered practical.

The original Filippini rotor and mono pump combination provided a reasonable amount of water with an overall system efficiency of up to 11 percent. Indications were that this could provide water at costs that would be lower than diesel systems and comparable with other wind pump designs that could not operate mono pumps.

There were, however, problems. Infrequent but severe storms produced gusts of winds that caused structural damage to the original rotors and towers. This was due mainly to the high profile drag rather than centrifugal loading, and although it was possible to strengthen the rotor and towers sufficiently, the costs of pro-

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## DEFINING THE APPROPRIATENESS OF A NOVEL TECHNOLOGY

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duction in doing so rose to the point where the Filippini system would be significantly more expensive to produce than conventional wind pumps on a cost-per-unit-of-water-delivered basis.

At this point a second set of wind tunnel tests to examine the high wind protection problem were arranged with the University of Waterloo.

A variety of fixed and movable geometries were examined in the wind tunnel to see whether the high wind loading could be reduced without affecting the rotor performance. Although it was possible to alter the design to reduce structural problems due to centrifugal forces and to reduce some of the problems of profile drag on the rotor itself, the main toppling moment on the tower structure remained. Changes that could reduce the overall profile drag caused a similar reduction in rotor performance and therefore, were not considered beneficial.

It appears, then, that the Filippini rotor will require much stronger towers than conventional horizontal-axis wind pumps in order to compensate for the lack of a high-wind protection system. This is likely to make it more expensive on a cost-per-unit-of-water-delivered basis. However, the Filippini rotor can operate the rotary-drive mono pumps without the need for a complicated transmission and is likely better suited for this purpose than the less efficient Savonius rotor.

There could be a role for small Filippini rotors. They could be used to operate mono pumps in areas where high wind protection presents fewer problems. However, it is likely that the Filippini system generally will not be as cost effective as conventional wind pumps. □

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*Richard Carothers is an engineer working with the University of Waterloo and the Institute for the Study and Application of Integrated Development based in Toronto, Canada. He was part of the research team testing the Filippini rotor in Botswana.*



# MANY VOICES

## THE LANGUAGES OF INDIA

ANDRÉ McNICOLL



**T**he language situation in India is dumbfounding. According to the census of 1961, there are 547 tongues of the Indo-Aryan group alone (a subgroup of the larger Indo-European language family to which Latin, Greek, the Germanic, Slavic, Romance, and other European languages belong) within the country's boundaries. Not as many as the 1500 distinct dialects said to be spoken by the dispersed and isolated tribes inhabiting New Guinea, but clearly enough to generate some awesome administrative, political, and social problems in a country committed to democracy and political order, and determined to stay on top of scientific research.

India's language mosaic is formed of four linguistic families: Dravidian (mainly Tamil, Telegu, Malayam, and Kannada); Indo-Aryan (Hindi, Bengali, Punjabi, Gujarati, Marathi, Sindhi, and the Rajput dialects); Austro-Asiatic (limited principally to a subgroup of languages spoken in the hills and forests of central and eastern India); and Sino-Tibetan (a group of tongues confined largely to the northeastern frontier area). But the language situation is much more complex than "four families." When one language crosses state boundaries it is often written in a script that is so different it cannot be read by the same group of speakers. This is the case, for instance, with Konkani which is spoken in Goa, Kar-

nataka, Maharashtra, and Kerala, but is written in a different script in each state. Some languages also form distinct regional dialects. Hindi, for example, is spoken quite differently as a mother tongue in Delhi, Rajasthan, and Bihar. This is also true of most of the major state languages.

### POLITICAL SIGNIFICANCE

Possibly in no other country in the world have languages played such an important political role. Virtually the entire political map of the Indian subcontinent has been shaped by linguistic imperatives. After partition in 1947, Dravidian speakers in the south agitated for a radical restructuring of the administration of the region into states



based upon languages. The first militant movement arose among the Telugu speakers who were divided between the states of Madras and Hyderabad. Prime Minister Jawarhal Nehru yielded to their demands and, in 1953, Andhra Pradesh came into being as a Telugu-speaking state. Many other linguistic claims followed. In 1956, a report of the States Reorganization Commission led to the whole political map of India being redrawn. The previous mixture of British-Indian provinces and princely states was reduced to a new pattern of 14 states representing linguistic regions. In the process, massive internal migrations took place — possibly the largest linguistic migrations in history. India had already experienced intense demographic dislocation at the time of partition when seven to eight million Indians fled to Pakistan and about the same number in the opposite direction. These were not “language refugees,” the main issue was religion, but language was involved.

### ENGLISH A “LINK” LANGUAGE

When India achieved independence the country's leaders were aware of the possibility of linguistic chaos and imposed important constitutional restraints. The Constitution recognized 14 official languages (see sidebar) and stipulated that Hindi should be the common language of the country. English was to be an official “link” language until 1965, when it should be replaced by Hindi. But this never came about. In 1965, faced with intense opposition from non-Hindi-speaking states to adopting Hindi, it was agreed that English be retained. The Official Languages Amendment Act of 1967 set no time limit on the official status of English. Correspondence in English was obligatory, however, only between the central government and a non-Hindi-speaking state. Hindi states dealing with non-Hindi-speaking states could send their communications in Hindi provided that English translations were also supplied.

In the 1961 census, 29 percent of India's population was grouped as Hindi-speaking; in the census that followed 10 years later, 38 percent claimed to be Hindi-speaking. But this substantial increase was partly accounted for by differences in reporting procedures, according to Dr B.P. Mahapatra, director of the Language Division at India's Office of the Registrar General and Census Commissioner. Languages are deeply divisive in India but the administration retains a remarkably flexible and open attitude. There is a constitutional requirement that stipulates that languages and cultures be preserved and children be taught in their mother tongue. “India has a liberal language policy,” says Dr Mahapatra. “We know that language is a problem for us, that it is nonintegrative. But we have never said, and will never say, there will be

only one language in India.”

Such extreme multilingualism can be a serious impediment to social progress. Poor communication among the host of different language communities and between the government and the general population can easily lead to lower levels of literacy, misunderstanding, suspicion, and chronic political tension. In the judiciary, multilingualism can be particularly problematic. A case may be heard in one language at one level, but in different

*“We know that language is a problem for us, that it is nonintegrative. But we have never said, and will never say, there will be only one language in India.”*

languages at subsequent levels. What happens with court documents, transcripts, or if the judges who hear the case speak different languages at different levels? And, of course, the government can never be assured that it is communicating effectively even when it does so in a state's official language. There may be several millions of people, often those most in need of the information, who will be either illiterate or will know only unofficial regional languages or dialects.

India badly needs a coordinated program of language training at both the national and local levels. But to implement such a program it must have a great deal of data to understand its extraordinary language mosaic.

The Cooperative Programs Division of IDRC has linked the Centre international de recherche sur le bilinguisme (CIRB) at Laval University, in Quebec, with the Language Division of the Office of the Registrar General in Calcutta, to conduct a comprehensive sociolinguistic survey in India in an effort to begin to supply language data.

Specifically, the project will produce a list of the written languages of India as well as a supplementary list of the spoken languages. The role of each of the languages in a number of areas such as the judiciary, business, radio, schools, and religion will be examined and documented. The study will determine the types and amount of written material available in each of the languages, analyze the data and recommend appropriate action on literacy campaigns, schools and teacher-training programs. The study data will also be used to prepare a volume on India as part of the series on the written languages of the world.

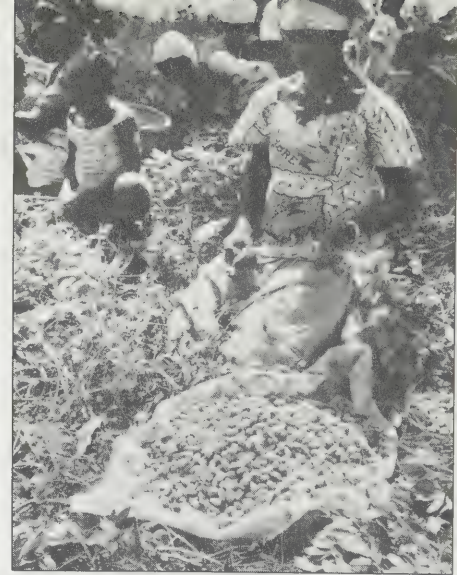
According to Dr G. McConnell, co-director of international projects at the CIRB, all the data have been collected and researchers are now proceeding with the verification and transposition of the data to situate each language in its larger cultural context. When the study is over, sometime in late 1986, a workshop will be held in India to publicize results, and one of the world's most complex language situations will be much better understood. □

*André McNicoll is senior writer in IDRC's Communications Division.*

The distribution of India's official languages according to the 1971 census.

Language	Number of speakers	Main state(s) where spoken
Assamese	8,959,558	Assam
Bengali	44,792,312	West Bengal
Gujarati	25,865,012	Gujarat
Hindi	208,514,005	Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh
Kannada	21,710,649	Mysore
Kashmiri	2,495,487	Jammu and Kashmir
Malayalam	21,938,760	Kerala
Marathi	41,765,190	Maharashtra
Oriya	19,863,198	Orissa
Punjabi	14,108,443	Punjab
Sindhi	1,676,875	Gujarat, Madhya Pradesh, Maharashtra, Rajasthan
Tamil	37,690,106	Tamil Nadu
Telugu	44,756,923	Andhra Pradesh
Urdu	28,620,895	Andhra Pradesh, Bihar, Maharashtra, Mysore, Uttar Pradesh





*Intercropping trial (left) and groundnut harvest: research starts and ends with the farmer*

# COMING FULL CIRCLE

## FARMERS' PARTICIPATION IN THE DEVELOPMENT OF TECHNOLOGY

AMY CHOUINARD

**E**ach May at harvest, potatoes flood the Lima marketplace in Peru. But by July and August, the price skyrockets because stocks are consumed. Anxious to stabilize the supply and protect producers and consumers from wide price swings the Peruvian government, as early as the 1960s, built huge storage facilities at high altitudes between Lima and the producing areas. The temperatures and humidities where the facilities were set up combined to prolong the shelf-life of potatoes.

Theoretically, everyone would gain. The farmers could store their potatoes while the market was glutted and still take advantage of higher prices later. Consumers could eat potatoes for more of the year without paying exorbitant prices. However, the facilities — technically sound and well designed — still stand as empty as the day they were opened. According to anthropologist Robert Rhoades of the International Potato Center (Centro Internacional de la Papa — CIP), they are massive "monuments to mistargeted development projects."

Researchers at CIP in Lima attempted to find out why the buildings were not used. The reasons were manifold: cultural and economic. For one thing, the labour costs and inconvenience to the farmer who had to load and move the harvest halfway to Lima, go home, and then return two months later to reload and move the tubers the rest of the way, were not offset by the higher prices the shuttle made possible. The damage to the tubers caused by handling added injury to inconvenience. Besides, the farmers were not primarily motivated by the profit to be made in

the urban market, and they were reasonably satisfied with their traditional storage methods. In their old manner they wasted nothing, as the spoiled tubers were fed to livestock. What they viewed as the problem was not just storage techniques per se, but the behaviour of stored seed potatoes. They complained that new improved varieties sprouted much earlier than the local cultivars grown previously and the long sprouts had to be removed before the seed potatoes could be planted.

### FROM THE FARMERS' SIDE

Thus, CIP staff took a new look at the directions of their research, this time with an understanding of the storage "problem" from the farmers' point of view. They focused on finding a better way to store seed potatoes. They were not immediately successful, but they continued to work with farmers until they came up with a practical solution. Even when they did design an appropriate package, many farmers adopted not the package but the fundamental principle: potatoes stored in diffused light do not sprout as early as do those stored in the dark or in direct light.

To the researchers, the lesson was that they needed to work with farmers continuously from the beginning of design work so that they could fine-tune their understanding of the problem.

If researchers are really working for farmers they have to take a new approach: find out what their boss needs, and expect to make a few mistakes while learning the job and trying to do it correctly. It's a new role not only for researchers but for farmers. The

past emphasis on demonstration, rather than research, on farmers' fields has established roles that are difficult to abandon. Researchers have been developing packages that they pass to extension workers for cooperating farmers to demonstrate. Many researchers feel that the credibility of science is at stake, and that if they test technologies that prove to be less useful than the ones farmers are already using they, and their research programs, suffer. They argue that they cannot expect farmers to waste time and effort on technologies that don't have a reasonable chance of success.

Others agree that farmers should not have to waste their time and effort. They contend, however, that farmers can be compensated for their losses and will provide more advice than criticism, if they understand that the goal of the tests is not to show them what works but to find out what does or doesn't work. Proponents of this side of the argument say that the constraints on farmers' fields can never be anticipated on research stations and that, if farmers consider the problem to be an important constraint, they will have as much interest as the researchers and may even have experimented on their own to find solutions.

According to this group, the main difference between researchers and farmers is the margin for error in experimentation. The researchers earn their livelihood by taking risks, but farmers risk their livelihood if they are wrong. Compared with farmers, researchers have inexhaustible resources of expertise and materials. According to Peter Matlon, an economist working for ICRISAT (International



Crops Research Institute for the Semi-Arid Tropics) in Burkina Faso (Upper Volta), if tests may fail a few times on farmers' fields, when they succeed they should be all the more impressive.

Since 1981, ICRISAT, in its projects in Burkina Faso and Niger, has placed itself firmly in the camp that is willing to make mistakes and learn from farmers. Although the successes to date have been small, the team believes it is headed in the right direction — away from prescribing techniques that work well only under controlled conditions on the research station.

#### MULTIDISCIPLINARY APPROACH

ICRISAT's team is multidisciplinary, including an anthropologist, economists, agronomists, plant breeders, and other specialists. They work together and with farmers, reporting to each other at regular meetings. Drawing on the anthropologist's reports about local villagers, they have been attempting to tailor their research to the needs expressed. They have been introducing improved varieties, different crop combinations and spacings, as well as other cultural techniques in on-farm tests that are divided into six levels on the basis of the farmers' contribution and, hence, risk. At one end of the scale are researcher-managed trials with virtually no input from farmers except advice. Land is made available by the farmer, who is compensated fully. At the other end are totally farmer-managed tests that are designed to simulate the conditions operating when a farmer has just adopted a new technology, with the farmer contributing all the costs and efforts.

To date, the learning has been pretty one-sided. For example, researchers discovered that the combinations of cowpea and sorghum that had proved optimal on the research station — and had even done well in researcher-managed trials on farmers' fields — did not really interest the local farmers.

In ICRISAT's experiments, the task of keeping track of tests has been made as simple as possible for the farmers and researchers. Test plots are identified by colour-coded stakes, and inputs are marked with the appropriate colour. The farmers keep yields and are encouraged to view the experiments as their own.

The farmers have generally had no trouble carrying out varietal tests in the ICRISAT projects, so staff were surprised when the farmers in tests of different cowpea densities varied widely in their adherence to the directions. The researchers tentatively concluded that the farmers either did not understand the instructions or did not view the different densities of cowpea as a new technology and saw no reason to modify their practices. A later analysis of the labour input, however, showed that by increasing the densities of cowpea, the researchers were inadvertently forcing the farmer to spend 25-50 percent more effort on weeding. Equally

### *Researchers earn their livelihood by taking risks, but farmers risk their livelihood*

important, because the researchers required the cowpea to be planted in a separate hole from the sorghum, they had increased planting effort by about 50 percent.

Matlon points out that this selective adoption of improvements is made difficult by researchers who insist on packaging technology. According to him, packages usually include some essential components, plus many other components that could either be left out entirely or be replaced by equally good substitutes. Yet, researchers seldom distinguish between the relative importance of the components. When farmers watch the experiments develop and participate in them, they know which are the essential components, and researchers can take the lead from them and pass the information to extension agents.

According to Matlon, farmers' tests are a challenge to the observation and

recording powers of researchers. ICRISAT staff have been careful to keep "improvements" and researcher interventions to the minimum necessary to satisfy the test objective, allowing farmers as much latitude to manage the plots as possible. Thus, the real task for the researchers is to record all the differences in management among a large population of farmers, asking questions and verifying the answers through observation. The potential for discovering responses of the technology is immense, but so is the research effort. And good researcher-farmer dialogue is essential.

The researcher must be willing to spend time with the farmer to build up mutual trust and, thus, minimize the errors that derive from a misunderstanding of the goal of the test plots. Otherwise, the farmer is likely to overestimate the yields from test plots or even provide special care to the plants in an effort to please the researcher. As the aim of tests on farmers' fields is to simulate normal management and conditions as well as to determine yields under those conditions, trust and honesty are essential in the partnership. □

*Amy Chouinard, formerly a technical editor in IDRC's communications division, attended a recent workshop on farmer participation held in Burkina Faso (Upper Volta).*

## A NEW LEARNING

Researchers, if they are to continue to justify development expenditures, are going to have to dig into more than just the dirt on research stations. They are going to have to delve into farmers' fields.

The old argument that they are producing useful packages but that national extension workers are falling down on their job by not passing the technologies to farmers, or that farmers are too stubborn or ignorant to adopt the packages, won't keep the money flowing into research any longer. Most funding agencies are determined to hold researchers accountable.

The farmers bring to research the knowledge and skills acquired in their long struggle against the harsh limitations imposed by the environment, a contribution that must be understood and properly appreciated by researchers.

In Mali, the Rural Economics Institute studies production systems from a multidisciplinary approach. Study has shown that it is best to organize agricultural research in Mali around cooperation between researchers, developers and farmers. Experiments have been done using three kinds of approach: agronomic tests, full scale demonstrations and management counselling.

In the agronomic tests, a distinc-

tion has to be made between tests run by farmers (farm tests) and those run by researchers (research tests). In the research tests, the farmer becomes, in one way or another, a paid worker providing the services required. In farm tests, the research is done entirely by the farmer and the results are observable in his or her agricultural production.

Full scale demonstrations are used to introduce a whole range of techniques for a given crop or for animal husbandry. New technology is often touched on in the demonstrations, but what does represent a real innovation is the method applied of selecting the different technologies that will best suit the needs of farmers. In demonstrations farmers play less of a role in the development of the project than they do in its execution and evaluation.

The third type of research tool, management counselling, takes the whole farm system into account and attempts, in a dialogue with farmers, to find out how to bring about improvements. The dialogue often continues over a period of years. Counselling is the best setting for cooperation between researchers and farmers. So far, it seems to be the system that offers the widest scope for genuine interchange.

*Pierrette Legros*



# LEAF NUTRIENT

## A NOVEL FOOD SOURCE

PHOEBE MUNRO

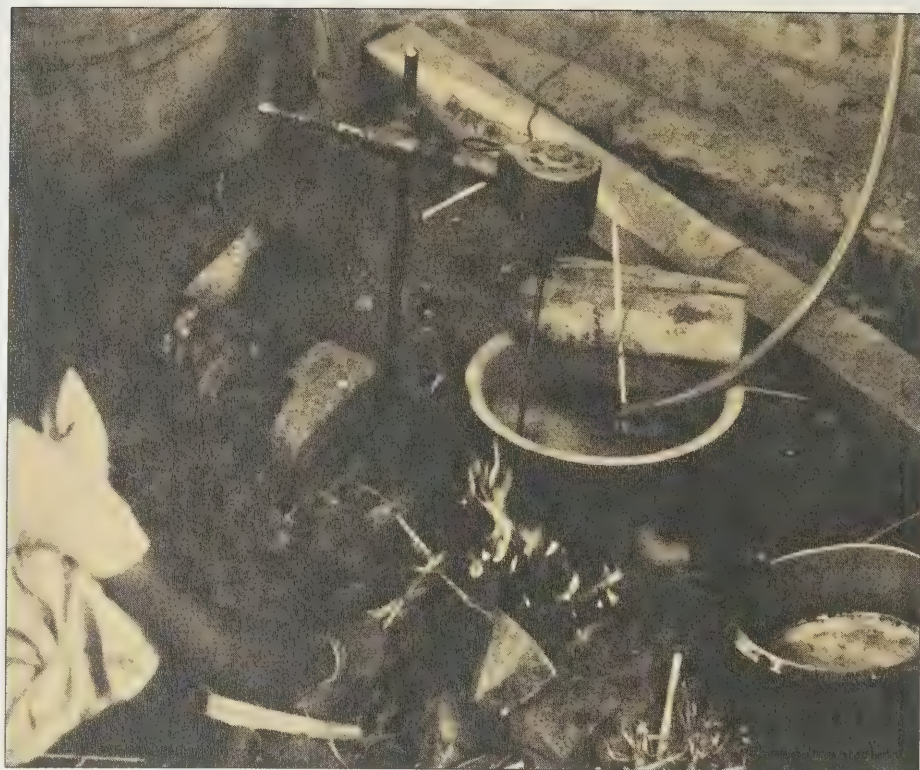
In a world shadowed by widespread malnutrition, a cheap, natural source of protein is drawing increasing research interest. Advocates of leaf nutrient concentrate claim it offers the highest yield per hectare of edible protein of any known technology and is much less expensive, in that it bypasses the expense of animal conversion. Its critics claim it lacks caloric value and essentials such as vitamin C.

The process of fractionation, or extraction of nutrients from leaves and grasses, dates back to the beginning of the century. Interest in the subject peaked during World War II in Britain, when a real fear of starvation created by a shipping blockade encouraged scientists to seek additional means of food self-sufficiency.

The technique, a simple pulping and pressing operation, was applied to a wide variety of green leaves, resulting in a moist green cake that could be added, à la tofu (bean curd), to existing foods. In addition to providing rich sources of protein, beta-carotene, iron and calcium, leaf nutrient served a useful purpose as a ruminant feed by-product and increased the productivity of farmland.

Developed at the Rothamstead Agricultural Centre, leaf nutrient was first used as a commercial animal feed, despite its original impetus as a nutritional supplement for people. Emphasis on its value for human consumption was decreased in the wake of a 1970 UN report, which challenged the use of protein to reduce malnutrition. Research seemed to indicate that if people consumed enough calories, their protein requirements would also be met. Concern about the so-called "protein gap" faded, replaced by an emphasis on increasing supplies of traditional foods. Despite this change in attitude, certain scientists continued to experiment with new applications of leaf protein technology.

In the mid-1970s, a series of feeding trials were undertaken in India. The best-known project took place at Coimbatore. Chosen because of its expertise in human feeding trials, the Coimbatore study focused on children between the ages of two and five. It showed that leaf extract, provided in 15-gram portions, promoted growth in



*Coagulating protein from leaf juice in India: cheap and abundant*

children with no side effects, and supplied the needed requirements of protein. Favourably compared with dried milk, it avoided the problem of lactose intolerance and its low bulk density made it uniquely suitable for small children, who often had trouble eating enough of the bulkier grains to get the nutrients they needed. In weaning situations, foods such as plantain, cassava and sweet potato could be mixed with leaf nutrient for better results.

### CAUTIONING ENTHUSIASM

While no one disputes leaf nutrient's potential, scientists are still divided on its application. In a recent UN report\*, based on the first 12 months of the 1979-1982 trials in Coimbatore, Leonard Joy argues that while leaf nutrient is rich in protein, vitamin A, calcium and iron, it is not viable for low-cost diets because it lacks high caloric value, and significant amounts of vitamins B<sub>2</sub> and C. He maintains that leaf nutrient is only viable where the cheapest food normally used is rich in calories, riboflavin, and vitamin C but deficient in protein, vitamin A and calcium.

Yet leaf nutrient does have some riboflavin, and its availability year round makes it cheaper than the price fluctuations on seasonal fruits and vegetables. Another study has shown that calories added to a protein-sufficient diet did not promote growth, while adding more protein did.

In addition to its obvious nutritional benefits, leaf nutrient offers a way to

increase the food supply, creating additional income and employment for rural communities and avoiding the impossible expense of vitamin pills or shots. Ruminants thrive on the by-products, thus creating a commercial value as animal feed.

Fractionation is also suitable for small-scale production, involving low capital costs. Traditional food grinders and small presses can be used at the household level, while fractionation for animal fodder has proven practical in India using local equipment and labour.

The nutrient production of leafy crops is higher per unit area than is grain, making it economically advantageous to farmers. Certain crops could be grown for their energy value, others for protein, vitamins, and minerals. On a larger scale, farmers could also produce green leaf for sale to fractionation plants, thus creating an additional source of income. Leaf nutrient has the added advantage of simplicity. It is a true convenience food. Easier to prepare than flour or grain products, it is no less acceptable in its natural state; indeed, in countries like Sri Lanka and Nigeria, green juice extracted from leaves has been eaten for years.

In a world where protein is desperately needed, it is simply another underexploited resource; one that is economical, feasible and safe. Despite his own reservations, Leonard Joy's report reaches the conclusion that further feeding trials are unnecessary and instead, recommends that the international community work to identify situations in which leaf nutrient could be put to best use. □

*Phoebe Munro is an Ottawa-based writer.*

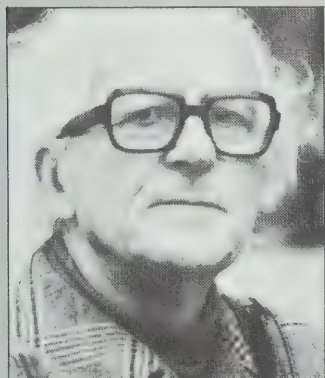
\*The Significance of Leaf Nutrient Concentrate in Reducing Human Malnutrition, Leonard Joy, UN Financing System for Science and Technology for Development.



## FOR A MORAL ECONOMY IN BANGLADESH

RENÉ DUMONT

*During a visit to Ottawa, René Dumont kindly took the time to speak to the staff of the IDRC about his recent mission to Bangladesh. An ardent defender of the rights of the Third World's most underprivileged populations, Mr Dumont sees himself as a passionate advocate for the Third World. He has been teaching at the Institut national d'agronomie in Paris for forty-one years and has written and had published some forty works on hunger in the Third World. Excerpts follow from the talk given by Mr Dumont.*



**T**he essential problem is that we have proposed, as our model of development to the Third World, an extraordinary one. Development, as it has been viewed by the United Nations for some twenty-five years, consists of bringing the Third World to resemble our civilization, as if the latter were a model of perfection. In fact, our consumer society is a model of waste. I have heard of a summer camp for dolls in the United States, with nurses assigned to care for the dolls. No better symbol of a decadent society could be found in the Roman Empire.

Is our society in a state of decline? Inequalities are certainly continuing to increase. In 1700, the ratio of wealth was more than two-to-one between the world's richest nation and poorest nation. Today, the ratio is sixty-to-one. Within the developing countries also, the gap

continues to widen. In 1958, it was said to be seventeen-to-one for the 40 percent of the population of Brazil that was the most impoverished and the 5 percent that was the richest. The latest estimates show this ratio to be thirty-three-to-one.

### PRODUCTION AND WEALTH

Increased production is seen as the solution to the world hunger problem, but the present total grain production is already sufficient to feed the entire population of the world. It is unequally distributed, however. Forty percent of the grain produced is used as livestock feed, and, moreover, the annual consumption (direct and indirect) of each North American is one tonne, as opposed to the 150 kilograms consumed by each inhabitant of South Asia and tropical Africa.

In Bangladesh, the population is growing at a rate of 2.8 percent, while the rate of growth of total agricultural production is only 1 percent and that of rice production is 1.8 percent. With increased rice production, however, there is decreased production of legumes and oilseeds — that is, forage crops, which produce high-protein foods. In Bangladesh, everything is set for the "green revolution": the necessary varieties and farming techniques exist, agronomists are available, and so on. Only the political will to reduce inequalities is lacking. The major obstacle to agricultural development is the growing number of landless peasants — those inhabitants owning less than a quarter hectare of land. Landless peasants make up half the

total population — close to 50 million.

The extreme poverty in Bangladesh is also the principal cause of the failure of its fertility regulation policy. It is to the advantage of poor families to have children, for children begin working at five years of age. A child who tends goats can earn his or her food, and at eight years of age, he or she can earn about three dollars a year. Because social security does not exist, each peasant wants to have a son who will feed him once he himself is no longer able to work. As long as poverty is rampant, there is no hope of seeing a decline in population growth.

A large percentage of agricultural land is cultivated by sharecroppers. Traditionally, the landowner and tenant farmer each receives half of the total crop; however, because the farmer assumes all expenses, he is actually left with approximately 30 percent of the net crop. It is clearly not to the advantage of the sharecropper to invest more capital in means of production. The majority of remaining land is cultivated by hired labourers. The average wage is 1.5 kilograms of paddy a day — that is, one kilogram of rice a day — except for the several weeks of the year during which harvesting and transplanting of the rice crop take place. During this period, wages double or triple. It has been estimated that farm workers devote only 20 percent of their time to agricultural activities and 30 percent to off-farm employment. The rest of the time they are unemployed.

Bangladesh research



institutes have confirmed that it is the peasant farmers who are the best cultivators and who have the highest agricultural output.

Nonetheless, these small farmers are unwilling to obtain credit to participate in the "green revolution" of high-yielding agricultural technologies. Because they do not have access to institutional credit, they have to borrow from usurious moneylenders. At 10 percent interest monthly, the use of fertilizers is no longer profitable. In Bangladesh, it is not a *latifundista* (great estate owner) who dominates, as in Brazil, but a village landowner. Once farmers own holdings of 2-20 hectares, they use sharecroppers or hired labourers. They also become merchants who buy the paddy of the peasant farmers during harvest and resell part of it to them at a 100 percent, or even 200 percent, profit. The reason is that the price doubles and possibly triples outside the harvesting season. The small village elites give work to their clients, and provide them credit at 10 percent interest monthly, with land as security. Moreover, in order to obtain this credit, the peasant farmer must pledge his last parcel of land or gold jewellery as security.

The World Bank decided to provide assistance to remedy this situation. It offered aid to seven *thanas* (a police division serving as local administration) of Bangladesh near Bogra and Mymensingh, where the agronomic teaching institute is located. The *thanas* were given special credit with the objective of increasing production. The funds arrived in 1976, at which time annual paddy production totalled 380 000 tons. The goal was to increase production to 660 000 tons through the investments of the World Bank, which would have made the "green revolution" a reality by providing irrigation canals, fertilizers, and new varieties. In 1983, on a visit to one of the seven *thanas*, we were informed

by the manager of the co-operative that the aid provided by the World Bank had only served to make the rich richer and the poor poorer.

The money was given to the credit co-operatives of the Comilla system. These co-operatives are run by the village elite, who distributed the money among themselves. So not all small farmers had access to this institutional credit provided at 17.5 percent interest annually. At least half of the funds provided by the World Bank were lent by the usurious moneylenders at their usual rates. Consequently, the World Bank loans were not effective in increasing production. Seven years later, the seven *thanas* that had received money from the World Bank had exactly the same agricultural output as those that had not received credit. In addition, the moneylenders were able to take over more land pledged as security. The result was a higher concentration of land ownership and greater impoverishment in the seven *thanas* than elsewhere — so much for the World Bank's action.

#### THE POLICE AND THE ARMY

Food aid constitutes another type of assistance, and is provided primarily by the United States, Canada, and the EEC. Of the \$141 million spent by Canada on food aid in 1982-83, Bangladesh received \$58 million, which makes it by far the most important recipient country for Canadian food aid. But where does this aid go? It is unconditionally handed over to the government, which distributes it according to a plan formulated in 1972. Under this plan, priority is given to members of the police and the army; 2000 000 in number, they pay a tenth of the market price for grain and receive three to four times more than they require. This means that they can resell some of it at a profit, more than doubling their salaries.

After the police and the army it is the country's six largest urban centres

which receive food aid. Some two-thirds of the population there receives food aid at approximately two-thirds of the market price. Those excluded are squatters and inhabitants of shantytowns who are not registered and do not have ration cards. The remaining small amount of aid goes to the villages, where it is handed out by the local elite, such as *thana* and union representatives, to their supporters and clients.

#### FOOD AID — A WEAPON

In 1974, there was particularly severe flooding and a serious threat of famine, especially in northern Bangladesh, and more specifically in the district of Rangpur. That year, food aid to the country was sharply reduced because the United States had decided to use the denial of food aid as a weapon. Bangladesh wanted to sell CA\$4 million worth of jute sacks to Cuba. The United States told them that if they did so, it would withhold food aid. This was immediately following the oil crisis, and the Americans wanted to compare the effectiveness of food aid as a weapon with that of oil.

Restrictions and distribution inefficiencies resulted in the deaths of 50 000 inhabitants of northern Bangladesh. In this light, the policy of the USA, the Bangladesh government, and the village tyrants were accomplices in the deaths. The American policy delayed food aid and the Bangladesh government did not ensure that food was fairly distributed to areas in which it was urgently needed. After food aid was cut off, an inventory was taken of the remaining stock in the province in which 50 000 inhabitants had died of starvation. There was enough food to have prevented all of the starvation deaths, but those who had the food withheld and concealed it with the objective of selling it at three or four times the normal price. They drove the small farmers to ruin by buying their last parcels of

land, which the latter were forced to sell at a quarter of their value as a result of poor harvests. The poor were forced to sell all of their possessions — their cattle, household utensils, and the like. Once again the ineffectiveness of food aid was illustrated.

It has been estimated that emergency aid (distributed in the case of floods, droughts, wars) represents only 7 percent of total food aid. The only effective food aid approach is the food-for-work formula. In 1973, I visited approximately 60 villages in Bangladesh during a two-month period. Pretty well the same situation existed in all the villages. An average of 50 to 100 peasants in each village needed 120 days of employment during the off-season in order to eat properly.

Before the large Hindu landowner, the *zamindar*, was stripped of his rights, he handled projects such as repairing irrigation and drainage systems and hiring labourers at low wages. Now these projects fall to the Bangladesh government, which does not have the necessary budget to continue them. Previously, this work provided, more or less, the number of work days required. But now a little more than 10 years later, all drainage systems and irrigation canals are in very poor condition and must be cleaned out. Workers could be paid with food for undertaking these useful projects.

Such a system would increase production and improve agriculture. This would be an excellent formula were it not for corruption. Studies indicate that the rural elite and union heads regularly steal between half to three-quarters of the wheat set aside for this purpose. In addition, no one is concerned about the usefulness of the work realized. A road is built leading to a river, but there is not enough money to construct a bridge. Is there nothing that can be done? Is the World Bank powerless to act because of questions of sovereignty? □



# BRIEFS

## Paddy husk hazard

Rice is a vital crop to the people of Malaysia. Besides being essential to their economy, it is also a dietary staple. Rice production in the country grew from 1.4 million tonnes in 1970 to just below 2 million tonnes in 1980. Rice milling forms an integral part of rice production, contributing significantly to employment. There are an estimated half a million rice farmers and about 15 000 mill workers involved in the rice industry.

However, Malaysian rice workers and communities near huge rice mills are continually exposed to the hazards of rice husk pollution. This pollution is caused by rice dust, which is released during the process of drying and milling the rice. It is composed of rice, husk and dirt particles.

Rice workers use handkerchiefs and towels as protection against these hazards, but Dr Lim Heng Haut, of Malaya University, says this is inadequate protection

because the particles are very tiny and can easily pass through cloth.

In collaboration with University Pertanian Malaysia and the Factories and Machinery Department, Dr Lim has studied the health condition of 122 male workers from three Malaysian rice mills.

The study has found a high incidence of irritating cough among rice mill workers. Over 66 percent of them had eye irritations and pruritus (itchy skin), half suffered from nasal catarrh (sneezing and running nose), one-third had rashes, and 27 percent suffered from tightness of the chest. As well, x-rays have shown 15 percent of rice mill workers had chest opacities (streaky white patches) in the lower mid-zones of their lungs.

Scientists believe the formation of fibrous tissues in the lungs of some workers may be a form of silicosis, common among quarry workers and potters, or a condition known as "extrinsic allergic alveolitis."

Rice husk is suspected as a cause because it has a high silica content. Because of its abrasive action, burnt rice husk has been used in detergents, dyes, and as a cleanser for turbo jet engines. *Sahabat Alam Malaysia*

## Zimbabwe's farmers counter drought

Deep in the worst drought in African history and at a time of continent-wide agricultural crisis, Zimbabwe's farmers have produced a miracle.

According to Agriculture Minister Denis Norman, the country's small-scale farmers, supported by government policy, have taught the rest of Africa a lesson in a dry season by returning Zimbabwe to close to its pre-independence food self-sufficiency and saving it millions of dollars in foreign currency.

By unexpectedly producing about 330 000 tonnes of maize the peasant farmers have enabled Zimbabwe to limit its imports to about the 290 000 tonnes it has already been given by donor countries. The ministry had projected the country would have to import up to 600 000 tonnes to meet local needs, some of it costing about CA \$290 per tonne.

Their remarkable performance is in sharp contrast to that of small-scale farmers across the continent. Hampered by drought and inappropriate government policies, African farmers have failed to meet the demands of a rapidly growing population. Per capita food production, which tumbled 10 percent in the 1970s, is continuing to fall, while cereal imports rose from 3.5 million tonnes in 1972 to 900 million by 1982.

What makes Zimbabwe different is that the government has recognized the importance and potential of small-scale farmers and has developed policies to encourage them as well as the about 3000 operators of the country's productive commercial farms.

Since independence in 1980, Zimbabwe has increasingly focused its

agricultural policy on peasants, who farm more than 41 percent of the country. During that time, maize collection depots have been moved from railheads to communal areas to lower transportation costs, the number of small farmers with access to credit has jumped from 3000 to nearly 70 000 and prices have been set at incentive levels.

Results have been impressive. Before independence the communal or peasant sector, contribution to maize production never exceeded 7.5 percent. This year it is expected to top 35 percent, a record.

Norman is candid about Africa's agricultural problems, and said he is "quite convinced" Zimbabwe's success holds a lesson for the rest of the continent.

"No agricultural industry in any part of the world will operate unless one has back-up services and structures," he said. "You've got to have a fairly organized research system, extension services, marketing services, financial arrangements. This is where we have the advantage over most Third World countries, and particularly the rest of Africa, because our systems do work."

*James Travers  
Southam News*

## Minimum tillage for the small-scale farmer

Small-scale farmers in Kenya may be able to increase productivity and decrease labour by employing minimum tillage methods.

Dr Ratemo Michieka, an agronomist at the Department of Crop Science of the University of Nairobi, is being supported by IDRC to research ways of improving present tillage methods in the country. He says small-scale farmers, who make up 80 percent of Kenya's farmers, have practiced some form of minimum tillage, but they lack the know-how to obtain maximum productivity.

Traditional tilling methods involve the use of hoes, pangas, ox-drawn ploughs, and other primitive farming tools.



Dust from rice processing poses hazards to handlers



Because the small-scale farmer cannot afford a tractor, work becomes more laborious and time consuming. Using traditional methods, a farmer can go through as many as three tilling stages before a seedbed is ready for sowing. This is especially true in areas of heavy rainfall.

Using minimum tillage techniques, farmers will cut down on ploughing and cultivating. Instead, seeds are planted in some of the stubble of the last crop and herbicides are used to control insects and weeds. As much as half the tilling work may be cut out. Minimum tillage may also mean reducing the number of tillage operations done on a piece of land in one season.

In tropical climates, minimum tillage is often more appropriate than deep ploughing. In seasons of heavy rainfall, deep ploughing can aggravate erosion. In semiarid areas, it can increase evaporation. Deep ploughing also reduces the level of organic matter in the soil.  
*Dorothy Kweyu Munyakho*



*Less plowing, more production*

### **More feed, more milk**

Even though in some developing countries livestock population is higher than human population, malnutrition caused by inadequate meat and milk consumption remains a serious problem.

While the lack of meat is due to the tradition of keeping livestock as a

sign of prestige rather than slaughtering it for food, the shortage of milk is the result of the cattle's nutrient-deficient diet.

Sponsored by IDRC, researchers from the University of Dar-es-Salaam faculty of agriculture, forestry and veterinary science are looking into ways of increasing the milk yield of cattle by improving the diet of the animals. The research is being done in the Western Kilimanjaro area in northern Tanzania.

Cattle that graze mainly on grass and water give a very low milk output — as little as two or three litres per day, often less. As a result, peasants try to keep as many cattle as possible to increase their amount of milk. This, however, is becoming less feasible as population increases and the land shortage becomes more acute.

Dr Ndelilio Urio, project leader, and his research team have found that cattle are fed on banana stumps, banana leaves, and ordinary roadside grass, as well as forage grown on small plots.

Dr Urio says there is a large protein deficiency with this kind of feed. As part of the project, he will be introducing legumes for farmers to grow on their plots. These legumes have a protein content between 12-18 percent, whereas grass has only about 4 percent.

According to Dr Urio, another problem is the inefficient use of crop residues. These residues, he says, could be turned into high quality animal feeds by being supplemented with nutrients they lack. Farmers will be taught how to mix food residues with molasses, urea products, and mineral supplements to obtain a highly nutritious dairy feed.

From the results of the project, scheduled to be completed in 1986, Dr Urio and his team will be able to make recommendations that will be applicable, not only in Tanzania, but in other developing countries with similar problems.

*Henry Muhanika*  
*Tanzania News Agency*

### **African potato association formed**

The potato is considered one of the world's most important foods, ranking only behind rice, wheat, and maize. Approximately 300 million tonnes are harvested annually in 130 countries. They are also a major feed crop.

Potatoes have a high nutritional value as well. A single potato provides half the adult daily requirement of Vitamin C. It is also superior to other food crops in the quality of its protein, and the ratio of that protein to carbohydrates is higher in potatoes than in many cereals and other roots and tubers. In nutritional balance — protein, amino acids, minerals and vitamins — the potato comes second only to eggs. In fact, 18 medium potatoes can meet all the daily nutritional needs of the average adult, if one could eat them all.

Because potatoes yield a higher return per unit area than any other crop, and because they mature faster than wheat, rice, or maize, they could prove to be a very important food

source to developing countries. Therefore, research into making this vegetable crop prosper in tropical and subtropical climates is crucial.

There is a greater variety of flora, fungi and other organisms in warmer countries that can cause serious viruses which decrease crop yields. In the fields, heat promotes premature sprouting, rotting and disease. Likewise, harvested potatoes rot easily in the high heat and humidity.

Recognizing the crop's potential, scientists from several major African potato-producing countries have recently come together to form the African Potato Association (APA). The association will act as a source of research exchange and to further the development of potato research, production and use in Africa, and in the professional development of African scientists working on the tuber.

For further information: Mr. Rakotondramana, President, APA, FIFAMANOR, BP 198 100, Antsirabe, Madagascar.



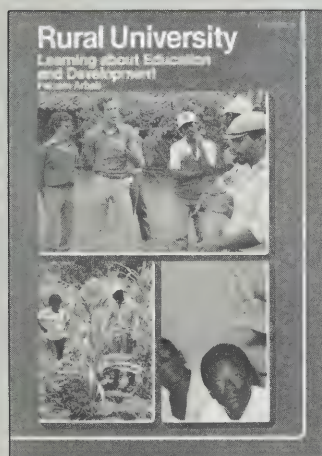


# NEW RELEASES

## Plantes-racines tropicales: culture et emplois en Afrique.

E.R. Terry, E.V. Doku, O.B. Arene, and N.M. Mahungu. Published November 1984, IDRC-221f.

This publication is a translation from the English *Tropical root crops: production and uses in Africa* (IDRC-221e), which was the result of the second symposium of the International Society for Tropical Root Crops — Africa Branch, with 77 participants from 16 countries. The focus was cassava, yams, cocoyams, and sweet potatoes. Learning from past successes and failures, researchers directed their efforts toward problems obstructing progress in reaching improved production and use of root crops and attempted to view, realistically, the context in which their results would be applied. This publication is a mixture of original research, updates on procedures, literature reviews, and survey reports.



## Rural university: learning about education and development.

Farzam Arbab. Published December 1984, 72 pages, IDRC-231e.

This publication describes the experiences of the Fundacion para la Aplicacion y Ensenanza de las Ciencias (FUNDAEC) from its inception in 1974 up to mid-1982. During these years, FUNDAEC developed a rural univer-

sity as an institution of learning for the inhabitants of Norte del Cauca, a rural region near the city of Cali in Colombia. The rural university has developed a series of learning processes, which fall into three main categories: the development of human resources, the application of science, and the strengthening of community structures. At the heart of these strategies of the rural university has been an educational program to provide the region with a pyramid of workers in rural well-being: engineers, technicians, and promoters. The details of the very successful educational innovation that made accelerated learning possible for the youth are discussed in this publication. The experiences of the students and their professors in setting in motion learning processes, especially those concerned with alternative production systems, associations for production, propagation of technology, and marketing systems, are also described in detail.

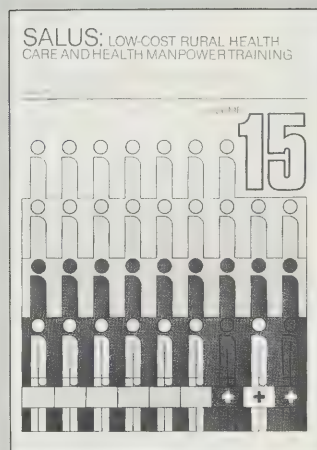
## Les contextes de recherche en éducation dans les pays en développement.

Sheldon Shaeffer, John A. Nkinyangi, editors. Published November 1984, IDRC-213f

This monograph, a translation from the English *Educational research environments in the developing world* (IDRC-213e), discusses the world of educational research through the various environments — content research, research for planning, evaluation research, and action research. It looks at the use of educational research to understand the state of the education system and its policies. The publication includes several case studies from Africa, Asia, Latin America, the Caribbean, and the Middle East.

## SALUS: low-cost rural health care and manpower training. Volume 12 (137 pages, IDRC-225e), Volume 13 (140 pages, IDRC-227e), Volume 14 (143 pages, IDRC-228e), Volume 15 (148 pages, IDRC-230e). Rosanna M. Betchel, editor. Published 1984.

These are the next four volumes in a series of bibliographies that compile and coordinates information, both published and unpublished, on non-traditional health care delivery systems. The focus in the current volumes remains on new models of health care delivery and the training and use of health care workers.



## Tropical timber for building materials in the Andean group countries of South America.

F.J. Keenan and M. Tejada. Published November 1984, 151 pages, IDRC-TS49e.

A very small percentage of timber in the tropical rain forests of Latin America is harvested; much of the residual forest is damaged or destroyed to clear the land for other uses. The practice of removing only the

choice species and utilizing only the best logs is extremely wasteful. An IDRC-supported project to research ways of achieving greater social and economic benefits from the tropical forests developed technology to use tropical woods as structural material for construction, rather than just decorative purposes. This publication summarizes the research undertaken by the Junta del Acuerdo de Cartagena (JUNAC), involving five Andean countries and 11 institutions.

## Infant mortality and health in Latin America: an annotated bibliography from the 1979-82 literature.

(Includes Spanish, Portuguese, and French entries.) Compiled by Mark Farren. Published October 1984, 127 pages, IDRC-226e.

During the 1960s and 1970s, mortality was a relatively neglected area of research in Latin America and other developing countries. Recent slowdowns in mortality decline in these countries, and the fact that mortality rates still remain unacceptably high, have renewed interest in studying mortality levels, trends, and differentials and their socioeconomic, cultural, and environmental determinants. The emerging research indicates that there is a need for a more adequate conceptual framework and that new variables, such as nutrition, morbidity, and disease treatment, must be incorporated into research designs. This bibliography attempts to systematize and facilitate access to the growing body of research on this topic.





**Bamboo and rattan ... page 13**

In addition to IDRC *Reports*, the Centre publishes a wide range of material on development issues. These include scientific monographs, reports, and bibliographies on specific IDRC research areas, as well as general interest literature. These publications represent research interests and activities supported by IDRC in agriculture, food and nutrition, population, health, education, information, and social sciences. Films describing the Centre and some of the areas of development research are also available. A catalogue of current material, publications or films, is available from the nearest IDRC regional office or from IDRC in Ottawa (see page 3 for complete addresses).

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